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EXPERIMENTAL STUDIES OF NATURAL PURIFICATION IN POLLUTED WATERS

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Introductory Note

Ever since the inauguration in the Public Health Service of systematic investigations of stream pollution, one of the major objectives in this work has been to acquire more extensive and exact knowledge concerning the operation of natural agencies in the process of purification of sewage-polluted waters. In the earlier stages of development, effort in this field was devoted principally to ascertaining, in a systematic way, the direction and extent of certain measurable and significant changes which actually could be observed in natural bodies of water under such circumstances that these changes could be attributed to natural agencies of purification. To this end the Potomac, the Ohio, the Illinois, and the Mississippi Rivers were selected as affording especially favorable conditions, and each of these streams was studied intensively for a period of one or more years, especial attention being paid to the condition of the water as indicated by (*a*) the biochemical oxygen demand, (*b*) the numbers of contained bacteria that would grow on standard culture media, and (*c*) the quality and quantity of free plankton and organisms found in it or in the bottom sediments.

The observations on these streams, added to the similar data available from other sources, have furnished a large mass of information concerning the chemical and biological changes indicated by the above-mentioned tests. As regards the rates at which these changes take place in particular river stretches at various seasons of the year, the information collected is quite direct and definite with respect to reduction in bacteria; is perhaps somewhat less direct but still distinctly significant as regards oxidation, and, with reference to plankton changes, is definite in a qualitative way but quantitatively is rather crude.

Since oxidation, bacterial reduction, and distinctive successions in plankton characteristically take place together, it is a legitimate inference that these changes are indicative of reactions which are closely interrelated; and this view has been widely held for many years. However, analysis of such interrelations from observations

on natural streams is difficult and apparently of quite limited application, because, even under the most favorable circumstances, the physical and biological conditions existing in a natural stream are highly complex, difficult to determine accurately, variable from day to day, and uncontrolled. Therefore, attempts have been made more or less continuously for some years past to reproduce, in laboratory samples, certain of the changes known to take place in nature in polluted waters, and to accomplish this under controlled experimental conditions so simplified as to permit of analysis and significant interpretation.

The paper which follows in this issue is the first of a series now in preparation, presenting some of the results of these experimental studies. As the subject matter will be presented in a sequence which does not always correspond to that followed in actual development of the experiments, some brief statement of the underlying general purpose is perhaps needed to indicate the relationship between the papers. Briefly stated, the general purpose of the studies to be here reported has been to acquire more definite information regarding the biological forces concerned in bringing about in polluted waters (1) the oxidation of putrescible organic matter by combination with dissolved atmospheric oxygen, (2) a reduction in numbers of bacteria of such kinds as grow on the usual standard bacteriological culture media, and (3) the life cycles of plankton and bottom sediment organisms. As studies of this range extend into the fields of bacteriology, planktonology, and chemistry, the investigations in question have been conducted jointly by a bacteriologist, a biologist, and a chemist, namely, Mr. C. T. Butterfield, Mr. W. C. Purdy, and Mr. E. J. Theriault, respectively, each being responsible for the technique relating to his own specialty.

The guiding principle in the conduct of these investigations has been that, in order to ascertain quantitatively and to evaluate separately the functions of bacteria and plankton in bringing about observed changes in the direction of purification, it is desirable not only to control environmental conditions but to simplify them to the utmost extent found compatible with reproducing the phenomena observed in natural waters. Applying this principle to studies of the factors governing the oxidation of organic matter in polluted waters, observations have been made in media inoculated with simple and known biological elements, first in pure culture, then proceeding step by step to more complex combinations, until finally the inoculum consisted of portions of sewage or polluted water, which presumably contained the fauna and flora of natural waters.

At the inception of these studies, and as they progressed, it became necessary to develop suitable working procedures and to assemble special equipment for conducting the experiments. Thus, for

observing the rates of oxidation in concentrated liquids without resort to dilution, a convenient and accurate form of apparatus was devised in which the experiment is conducted in a closed system. Again, in order to place all the experimental data on a comparable basis, it appeared necessary to employ a readily reproducible medium having characteristics essentially similar to those of sewage or sewage-polluted water. Moreover, a standardized dilution water of definite mineral content, and one which does not affect the microscopic life detrimentally, was also essential.

In the course of the study various problems were encountered which required special studies of analytical procedures. Thus in the presence of large amounts of glucose and peptone, the determination of dissolved oxygen by the Winkler method proved utterly unsatisfactory. The development of a satisfactory technique has thrown considerable light on the mechanism of the interference caused by organic materials. In another direction, a procedure has been developed for the iodometric determination of gaseous oxygen in small amounts, using the Winkler reagents as absorbents.

From the bacteriological viewpoint it was deemed important to ascertain the conditions required for obtaining an optimum growth of the test organisms used. Accordingly, studies were made (1) of the nature and amounts of organic substances that would produce such growth and at the same time maintain aerobic conditions in the sample, (2) of the range of hydrogen-ion concentration most favorable for bacterial growth, and (3) of the kinds and concentrations of mineral salts needed to stimulate bacterial multiplication and to minimize the lag in bacterial activity usually encountered when dilute solutions of nutrient media are used.

The culture and maintenance of the necessary plankton organisms likewise required special attention. The isolation of pure, bacteria-free cultures of various species of plankton has proved most difficult and time consuming and, in fact, has succeeded only in certain instances. The maintenance of certain of these cultures and the promotion of their normal development have been no less arduous. Suitable environmental conditions, nutriment, and other factors to which ceratin types appear most sensitive, have yet to be determined before the studies as planned can be considered complete. Sufficient progress has been made, however, with such forms as *Colpidium*, *Paramœcium* etc., to indicate quite definitely some of the relations of these plankton forms to the process of natural purification.

A discussion of these procedures and appliances is to be included in the papers of this series designed to present the results of the experiments themselves and their interpretation. The first paper of this series follows.

I. APPARATUS AND TECHNIQUE FOR THE STUDY OF BIOCHEMICAL AND OTHER OXIDATIONS IN LIQUIDS

By EMERY J. THERIAULT, *Chemist*, and C. T. BUTTERFIELD, *Bacteriologist*, *Stream Pollution Investigations, United States Public Health Service, Cincinnati, Ohio*

Quantitative measurements of air oxidations in bacteriological media and in polluted waters offer many difficulties to the experimenter. By the bacteriologist, focusing upon the cell, these changes are generally referred to as evidences of "microbial respiration." By the chemist, looking only at the liquid, the same changes are expressed in terms of "oxygen demand." While other isolated viewpoints might be cited in which air oxidations are relegated to a minor rôle, it is perhaps significant that the study of these deoxygenation phenomena has furnished quantitative data which, for reproducibility and precision, are almost unique in the biological field. Thus, the "respiratory quotients" of the bacteriologists (cf. Novy and Soule, 1925) appear to be unvarying characterizations of microbial behavior. Correspondingly, the studies of the chemists (cf. Theriault, 1927, for a review) indicate that the deoxygenation induced by bacteria and plankton in polluted waters proceeds with a regularity which compares favorably with that of most chemical reactions which have been reported in the literature.

THE DILUTION METHOD

With regard mainly to the sanitary aspects of stream pollution and similar problems, the study of air oxidations has long been pursued at the Stream Pollution Laboratory of the United States Public Health Service. With moderately polluted waters, the course of the deoxygenation can readily be followed by dissolved oxygen determinations at suitable intervals. With grossly polluted waters, it becomes necessary to dilute the samples with aerated water until the oxygen requirement of the mixtures does not exceed the solubility of oxygen under given conditions of salt concentration and temperature (about 9 milligrams per liter at 20° C). Troublesome corrections are thereby introduced for the oxygen demand of the dilution water.

Another objection to this dilution procedure is that the concentration of food material may be reduced below the food requirements of important forms of plankton or even of bacterial life. Thus, the 0.5 per cent dextrose-peptone-phosphate medium of Clark possesses an oxygen requirement in the presence of *Bact. aerogenes* and *Colpidium colpoda* of about 5,000 milligrams per liter. For use in the dilution method, this medium must accordingly be diluted 1,000 times, so that the resulting medium contains only 0.0005 per cent of dextrose and of peptone. *Colpidium* with *Bact. aerogenes* still

grows well in this medium; although, in the absence of *aerogenes*, *Colpidium* fails to grow at that concentration. It will grow in 0.05 per cent broth even in the absence of bacteria.

THE "AERATION" METHOD

It is the purpose of this paper to describe a procedure adapted to the study of air oxidations in liquid media of high food concentration. Essentially, a bottle of convenient size is partly filled with the sample the oxygen requirement of which is to be determined. The bottle is then closed by a glass (or rubber) stopper provided with the necessary stopcocks and capillary tubes for sampling both the air and the liquid in the bottle. By methods of analysis which will presently be described, the total oxygen content (gaseous and dissolved) of the closed system can be determined at the start of a test and at suitable intervals thereafter, so that the course of the deoxygenation is readily followed.

In oxygen-demand studies the advantages of the method are numerous. Thus, the difficulties connected with the choice of a suitable dilution water are entirely avoided; it is possible to conduct a series of tests for bacteria and plankton all on the same sample; natural conditions are closely simulated; large volumes of sample may be used; the method may be used for the study of organisms which grow indifferently, if at all, in dilute media. Apart from its usefulness in oxygen-demand studies, the procedure also appears well adapted to studies of microbial respiration and, possibly, to certain types of industrial problems.

Analysis of gaseous oxygen.—The selection of a method of analysis for gaseous oxygen in the closed system just described is conditioned by the fact that, if repeated examinations are to be made, the volume of gas withdrawn at each sampling period must necessarily be small; otherwise the air supply will soon become exhausted. The method used, therefore, should be highly accurate.

With a view to developing a method suitable for use in laboratories with limited facilities for gas analysis, experiments were made with a procedure depending on the oxidation of manganous hydroxide to manganic hydroxide by gaseous oxygen and the subsequent titration of the iodine liberated from an iodide on acidification. Phillips (1894) made use of this procedure as a qualitative test for gaseous oxygen. Burrell and Siebert (1926) give some data which indicate that the method is capable of quantitative application. Applied to *dissolved oxygen*, the procedure forms the basis of the well-known Winkler method (Winkler, 1888).

Our own experiments indicate that gaseous oxygen is completely absorbed by an alkaline solution of manganous sulphate just as readily as by the usual alkaline-pyrogallol solution. Using 10-ml.

portions of air, the precision attainable compares very favorably with that of refined methods of gas analysis. A decided advantage in the ordinary laboratory is that troublesome corrections for barometric pressure and temperature are unnecessary (cf. Adeney, 1908). Compensating devices requiring a more or less elaborate calibration are not used (cf. Novy, Roehm, and Soule, 1925). With minor modifications, the method could still be employed when other gases (e. g., carbon dioxide) are to be determined (cf. Sierp, 1927).

Apparatus and technique.—Figure 1 shows an assembly of apparatus which has proved very satisfactory. For a test, stopcock A of the U-shaped oxygen absorption vessel placed at the extreme right of Figure 1 is turned so as to communicate with the 2-ml. cup and, after the solid stopper has been removed, distilled water of known oxygen content is siphoned from a reservoir into the right-hand limb of the U-tube. During the process of filling, the delivery tube of the siphon is kept near the bottom of the U-tube and enough water is added to fill the capillary bore leading to the 2-ml. cup. The stopcock is then turned so as to communicate with the capillary tube which is placed alongside the cup.

The oxygen absorption vessel is then connected to the upper right-hand capillary tube of a water-jacketed gas sampling pipette which has previously been filled with mercury from a reservoir attached to the lower capillary of the pipette. By lowering the mercury reservoir, water is drawn from the U-tube into the sampling pipette, thereby filling the capillaries which connect the two vessels. The sampling pipette is then connected to the "incubator" bottle, and the water in the pipette is ejected by manipulating stopcocks B and C, filling the system with mercury. A sample of gas of known volume is collected by turning stopcock C and bringing the mercury level to a predetermined mark on the lower (graduated) capillary of the sampling pipette. The gas is then transferred to the absorption vessel and this vessel is disconnected from the rest of the apparatus. After the solid stopper has been replaced, any droplets of mercury introduced with the gas sample may be removed through the capillary tube while the absorption vessel is held in an inverted position. Larger amounts of mercury may be withdrawn with a mercury pipette through the open limb of the U-tube. The presence of mercury in the absorption vessel is objectionable, owing to a reaction with free iodine at a later stage of the analysis.

With stopcock A closed, and with the gas in the closed limb of the U-tube, 1 ml. each of the usual Winkler reagents[1] is added through the open limb of the tube. In adding the reagents, the pipettes are inserted to the bottom of the U-tube and care is taken not to deliver any reagent in the upper part of the tube. For this reason, pipettes which

[1] Manganous sulphate solution: 480 grams of $MnSO_4.4H_2O$ per liter. Alkaline-iodide solution: 500 grams of NaOH and 135 grams of NaI per liter. Potassium salts may be subsituted.

terminate in tubes of small bore should be used and, after being filled with the reagent, the outside of the pipettes should be flushed with running water. When the reagents have been added, the stopper is replaced and the U-tube is agitated, mechanically or otherwise, for 10 minutes.

For the acidification, a possible procedure is to wait about 20 minutes or until the finely divided precipitate of manganese hydroxides has settled to the lower part of the absorption vessel. The

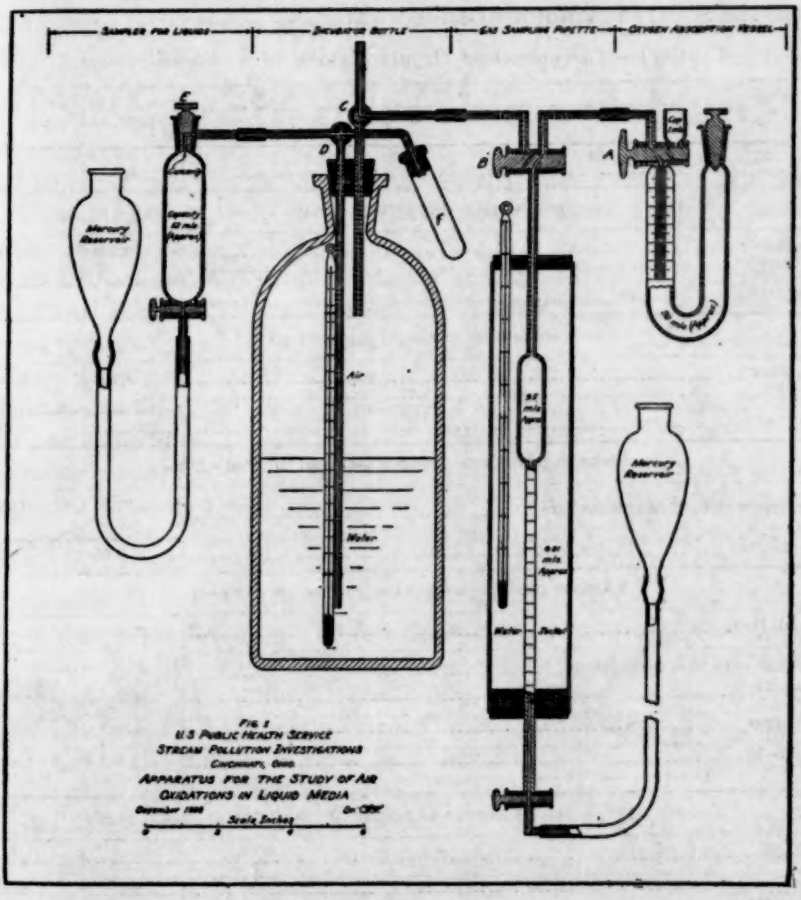


FIG. 1

sample is then acidified through the open limb of the absorption vessel in the usual manner. However, to save time, the acid (1 ml. of conc. H_2SO_4, sp. gr. 1.84) may be added to the 2-ml. cup and allowed to run into the U-tube. After shaking to dissolve the precipitate, the liberated iodine is titrated with 0.025 M sodium thiosulphate (1 ml. of 0.025 M thiosulphate corresponds to 0.2 mg. of O_2).

The volume of oxygenated distilled water added to the absorption vessel may be calculated on the basis of the total volume of liquid

after titration or else, more conveniently, it may be read off directly if the U-tube is calibrated with reference to arbitrary markings as shown in Figure 1. For the calibration, the vessel is first completely filled with water. Measured volumes are then successively withdrawn, the stopper being replaced each time and the vessel manipulated so that the air-water interface coincides with the markings on the U-tube. On the assumption that the Winkler reagents are quite free from dissolved oxygen, a deduction of 2 ml. should be made from the apparent volume of added water.

TABLE 1.—*Computations: Oxygen demand of undiluted sewage*

Date, 1928	Oct. 8, 3.30 p. m.	Oct. 9, 3.30 p. m.
Days	0	1
VOLUME OF LIQUID BEFORE AND AFTER SAMPLING (W AND W'—ml.)		
W = Before	10,230	10,183
S = Samples	47	
W' = After	10,183	
VOLUME OF EXPANDED GAS (=V ml.)		
V' = T − W	8,958	9,005
C = c + v		10
V = V' + C		9,015
DISSOLVED OXYGEN IN ADDED WATER (ml. titrated = 200)		
Readings with 0.025 M thiosulphate	28.37 20.32	15.18 7.18
A = Mg/liter	8.05	8.00
GASEOUS OXYGEN—MILLIGRAMS PER ML. OF GAS (=r)		
B = ml. H_2O	41.0	41.0
v = ml. gas	10.000	10.000
Readings with N/40 thiosulphate	20.31 5.60	32.15 23.27
D = R'' − R'	14.71	8.88
f = Factor	.2000	.2000
fD = Mgm	2.942	1.776
E = AB/1,000	.330	.328
F = fD − E	2.612	1.448
r = F/v	.2612	.1448
GASEOUS OXYGEN BEFORE SAMPLING—MILLIGRAMS PER LITER OF LIQUID (=g)		
rV		1,305
e		0
G = rV − e		1,305
g = 1,000 G/W		128.2
GASEOUS OXYGEN AFTER SAMPLING—MILLIGRAMS PER LITER OF LIQUID (=g')		
G' = rV'	2,340	
g' = 1,000 G'/W'	229.8	
DISSOLVED OXYGEN IN LIQUID—MILLIGRAMS PER LITER OF LIQUID (=w)		
Taken	46.4	46.4
Reagents	1.0	1.0
Titrated	45.4	45.4
Readings with 0.005 M thiosulphate	8.50 .02	3.81 2.38
M = R_2 − R_1	8.48	1.43
m = Factor	.881	.881
w = mM	7.5	1.3

TABLE 2.—*Computations: Oxygen demand of undiluted sewage*

Dates, 1928, Oct. 8-9
t′ to t=0 to 1

INITIAL OXYGEN CONTENT—TOTAL MILLIGRAMS PER LITER OF LIQUID (=O′)	
w	7.5
g′	229.8
O′=w+g′	237.3
FINAL OXYGEN CONTENT—TOTAL MILLIGRAMS PER LITER OF LIQUID (=O)	
w	1.3
g	128.2
O=w+g	129.5
OXYGEN DEMAND OVER GIVEN PERIOD (z=MILLIGRAMS PER LITER, t′ to t)	
z=O′−O	107.8
OXYGEN DEMAND—CUMULATIVE—(Y=Σz=MILLIGRAMS PER LITER, TOTAL)	
t	1
Y	107.8

COMPUTATION OF THE GASEOUS OXYGEN PER ML. OF GAS

In the example given in the first column of Table 1, the water added to the U-tube contained 8.05 milligrams of dissolved oxygen per liter. (When 200 ml. of water are titrated, each milliliter of 0.025 M thiosulphate corresponds to 1 mg. of dissolved oxygen per liter.) In this experiment, the net volume of added water was found to be 41.0 ml. and the titration of the liberated iodine required 14.71 ml. of 0.025 M thiosulphate, corresponding to 2.942 mg. of oxygen. The correction to be applied for the presence of 41.0 ml. of added water is

$$\frac{8.05\times 41.0}{1{,}000}=0.330 \text{ mg.}$$

Hence, the gas examined contained $2.942-0.330=2.612$ milligrams of oxygen in 10 ml., corresponding to a value of $r=0.2612$ milligram per milliliter.

As pictured in Figure 1, the absorption vessel is designed for the analysis of 10-ml. portions of gas containing 21 per cent or less of oxygen and 70 per cent or more of nitrogen, corresponding to the gas mixtures analyzed when air is used as a source of oxygen in biochemical experiments. When pure oxygen or gaseous mixtures of high oxygen content are to be examined, smaller samples (say 1 or 2 ml.) should be used, reliance being placed on the liberation of dissolved nitrogen from the added water for the avoidance of too high a vacuum in the absorption vessel. With mixtures of oxygen and gases that are completely absorbed by an alkaline reagent, it may be necessary either to absorb the other gases or else to dilute with nitrogen gas, before absorbing the oxygen.

THE DETERMINATION OF THE DISSOLVED OXYGEN

For the determination of the oxygen dissolved in the liquid, use is made of the sampler for liquids shown attached to the "incubator" bottle at the left of Figure 1. With stopcock E in position, as shown in Figure 1, the sampler is filled with mercury from a reservoir through the connecting capillaries to stopcock D. The liquid is then withdrawn by displacement when the mercury reservoir is lowered. At this time a sample for bacteriological and planktological analysis may be withdrawn by manipulating stopcock D and forcing a portion of the liquid in the sampler into a sterile test tube F by raising the mercury reservoir. Air bubbles, if present, are also removed by this procedure. When the sampler is full, stopcock D is closed and the apparatus is disconnected from the "incubator" bottle. The dissolved oxygen content is then determined in the usual manner, using 0.5 ml. each of the Winkler reagents, followed by agitation and the addition of 0.5 ml. of concentrated sulphuric acid when the precipitate has settled sufficiently. The liberated iodine is titrated with 0.005 M sodium thiosulphate.

Provided that nitrites, iron salts, and organic matter are present only in relatively small amounts, the unmodified Winkler process just described will give very satisfactory results. Effective and readily applied methods for overcoming interference by nitrites and by iron salts are fully discussed in Public Health Bulletin No. 151 (Theriault, 1925).

As to the interference due to organic substances, dextrose and peptone, for example, it is well known that such materials are not completely oxidized by treatment with permanganate in the cold, although they are readily oxidized in highly alkaline solutions even in the absence of permanganate. For this reason the period of contact of the organic matter with an alkalinized sample should be reduced to the minimum time consistent with the complete absorption of the dissolved oxygen. It may safely be assumed that absorption of dissolved oxygen will be practically complete when a precipitate of manganous hydroxide is agitated continuously in a closed bottle for 20 to 25 seconds. If a sample is then acidified as soon as the precipitate has settled, accurate results will be obtained in the presence of 1,000 parts per million of either dextrose or peptone. Larger amounts of organic materials may be present (say 5,000 p. p. m. or 0.5 per cent of dextrose) without introducing an appreciable error, if the sample is acidified before the precipitate has settled (that is, immediately after shaking), suitable allowance being made for a slight loss of precipitate by displacement on adding the acid.

Concentrated solutions of peptone possess a high "immediate" oxygen demand (oxidation of cysteine?). Erroneous conclusions

may therefore be drawn if the test solutions are prepared by adding small volumes of a stock solution of peptone to distilled water of known oxygen content (cf. Cooper, Cooper and Heward, 1919, pp. 350–352). A better indication of the actual behavior of peptone is obtained by working with aerated solutions. A similar precaution is required with sewage (cf. Theriault, 1925, pp. 26–28).

A preliminary treatment of the sample with permanganate (Rideal-Stewart modification of the Winkler method) is not recommended as a corrective for the presence of organic matter.

In this connection it should be borne in mind that when the organic matter content of a sample is exceedingly high, the dissolved oxygen figure may be negligibly small in relation to the total oxygen requirement of the liquid. It is also to be considered that a fair approximation of the dissolved oxygen content may be obtained by a simple calculation based on the known solubility of oxygen in water. Within the limits of the usual concentrations of mineral salts and food supply in biological experimentation, the solubility of oxygen may be regarded as equal to that of the gas in pure water.

COMPUTATION OF THE DISSOLVED OXYGEN IN MILLIGRAMS PER LITER

Using a sampler with a capacity of 46.4 ml., and displacing 1 ml. of liquid with the reagents, the net amount of liquid titrated is 45.4 ml. When 0.005 M thiosulphate is used, the factor to be applied to obtain milligrams per liter is

$$\frac{40}{\text{Net milliliters of liquid titrated}} = \frac{40}{45.4} = 0.881$$

If 45.4 ml. of liquid require 8.48 ml. of 0.005 M thiosulphate (see Table 1), the dissolved oxygen content of the liquid sampled is $8.48 \times 0.881 = 7.5$ milligrams per liter. This computation could evidently be simplified by using a sampling vessel with a capacity of 41.0 ml.

COMPUTATION OF OXYGEN DEMAND

In the example given in Table 1, the total volume, T, of the "incubator" bottle, with the stopper and stopcocks in position, was 19,188 ml. and the volume of liquid added, W, was 10,230 ml. Hence, the volume, V', of the air space was $V' = T - W = 19{,}188 - 10{,}230 = 8{,}958$ ml., all readings being referred to a temperature of 20° C. Using the methods and apparatus already described, the gaseous oxygen content, r, in milligrams of oxygen per ml. of gas, was found to be 0.2612, so that the total gaseous oxygen content of the liquid, after sampling, was $G' = rV' = 0.2612 \times 8{,}958 = 2{,}340$ milligrams. As 47 ml. of liquid were withdrawn ($47 = 46.4 + 0.6$) for the determination of dissolved oxygen, the volume, W', of the liquid, after samp-

ling, was 10,230 − 47 = 10,183 ml. After sampling, the amount of gaseous oxygen present per liter of liquid accordingly was

$$g' = \frac{1{,}000\ G'}{W'} = \frac{1{,}000 \times 2{,}340}{10{,}183} = 229.8$$

As the dissolved oxygen content of this sample was 7.5 milligrams per liter, it follows that, as recorded in Table 2, the initial oxygen content, O', was 229.8 + 7.5 = 237.3 milligrams per liter of liquid.

After storage for 24 hours in an incubator held at 20° C., the total oxygen content of the "incubator" bottle was redetermined, with the results given in the second column of Tables 1 and 2. In computing gaseous oxygen content of the bottle *before sampling*, an allowance must be made for the oxygen removed for analysis. For this reason, the calculation is based on the volume, V, of the gas after it has been expanded to a predetermined mark on the sampling pipette. The volume, V, is given by the expression $V = V' + C$, where C is the volume of the gas removed during sampling. The volume, C, is composed of the volume, v, of the sampling pipette plus the volume, c, of the capillary connections. In Table 1 it has been assumed that the volume of gas in the capillaries was negligibly small. If gas samples are removed for other analyses (or if more oxygen is added during incubation), a suitable correction, e, must be applied. In Table 1, e = zero.

The total oxygen content of the "incubator" bottle after storage for 24 hours was 129.5 milligrams per liter of liquid. Hence, from Table 2, the 1-day oxygen demand of the liquid was 107.8 milligrams per liter or, in the usual nomenclature, 107.8 parts per million.

MECHANICAL AGITATION DURING STORAGE

The data of Tables 1 and 2 indicate a loss of oxygen of 107.8 milligrams per liter in 24 hours. As the saturation value for atmospheric oxygen in distilled water at 20° C. is only 9.2 milligrams per liter, and as reaeration in a quiescent vessel is very slow, it is apparent that mechanical agitation must be provided when the oxygen demand of a sample greatly exceeds 9 milligrams per liter.

When the amount of oxygen to be supplied to the liquid exceeds, say, 100 milligrams per liter daily, use may be made of the arrangement shown in Figure 2 for the reaeration of a liquid in a closed system. In Figure 2, an alternating motion is imparted to the mercury in the U-tube by a loosely-fitting plunger connected to a suitable source of mechanical power. (*Cf.* Chatterji and Finch, 1925; various other forms of alternators have been described by Taylor 1928; Donnelly et al., 1927; and others). On the upstroke the capillary, C, acts as a seal and air is drawn through the valve, V. On the downstroke the

valve, V, closes and air is expelled in a fine stream through the capillary, C.

The metal-ball valves commonly used in the bulbs of atomizers and automatic burettes have been found very satisfactory for use in this apparatus. Inhibitory effects due to mercury have not been observed

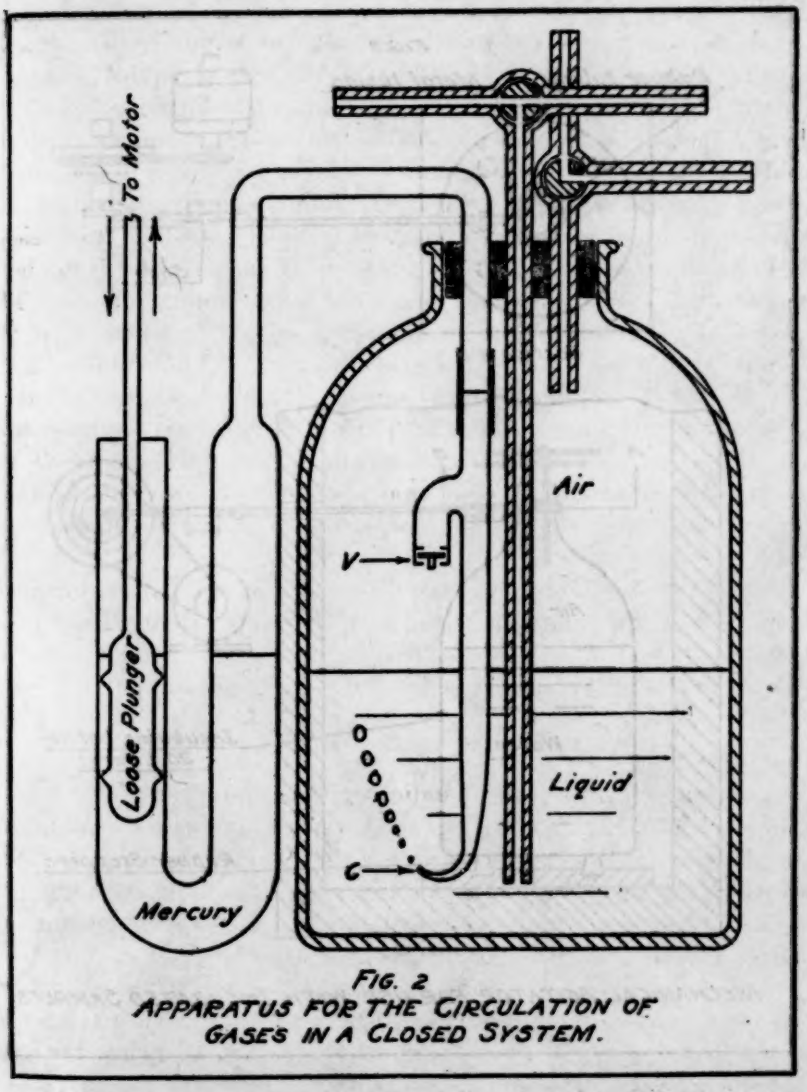
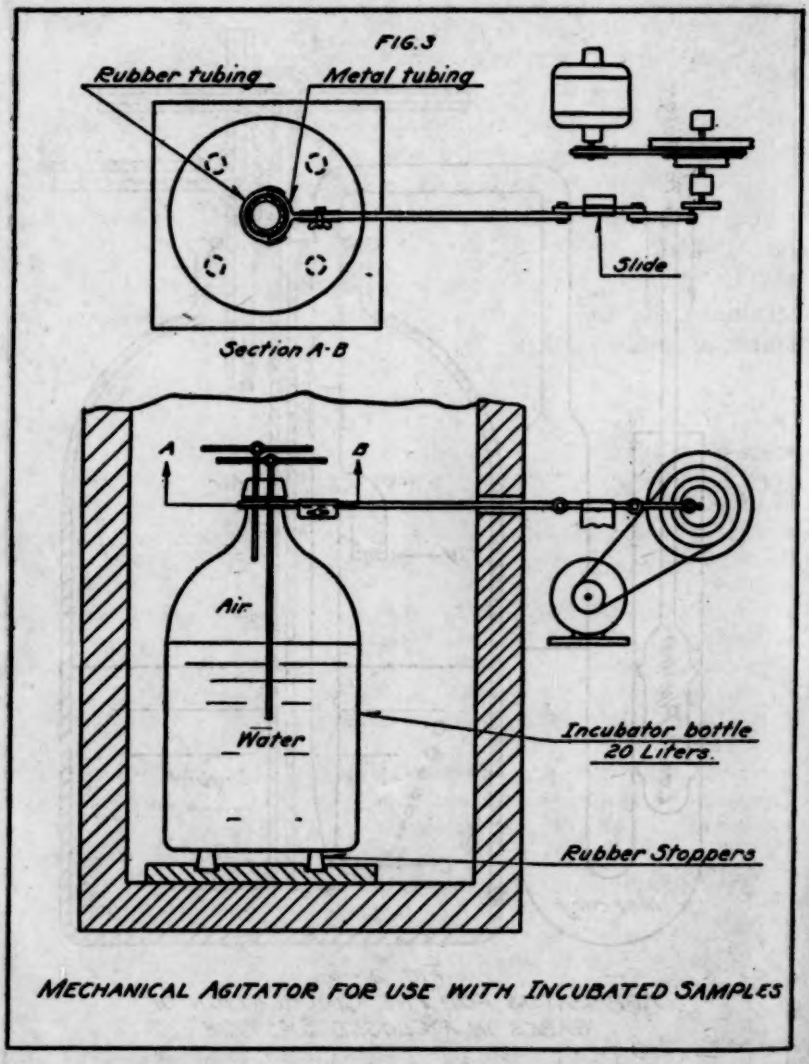


FIG. 2
APPARATUS FOR THE CIRCULATION OF GASES IN A CLOSED SYSTEM.

in experiments with *Bact. aerogenes* and various plankton forms, and with the mixed cultures naturally present in polluted waters. It is to be noted, however, that Novy and Soule (1925) have reported poor growth when attempts were made to grow the tubercle bacillus in the presence of mercury vapor. To some extent this effect might be prevented by keeping a layer of water over the mercury.

With liquids the oxygen requirement of which does not greatly exceed 50 milligrams per liter daily, the mechanical agitator shown in Figure 3 has been found very satisfactory. The "incubator" bottle in Figure 3 is a 20-liter carboy placed on rubber stoppers which rest on the bottom (suitably reinforced) of a Hearson 20° incubator. Motive



MECHANICAL AGITATOR FOR USE WITH INCUBATED SAMPLES

power is furnished by a small fan motor actuating a rod flexibly connected to the neck of the bottle through suitable reducing gears and other mechanisms, as shown in Figure 3. The cushioning effect of the rubber stoppers and of the flexible connection at the neck of the bottle operates to reduce the load on the motor when the liquid in the bottle is thrown into violent agitation.

Acknowledgment is due to Mr. W. C. Purdy, plankton expert, United States Public Health Service, for the design and construction of the mechanical agitator shown in Figure 3, and to Mr. C. T. Wright, technical assistant in sanitary engineering, for preparing the figures which accompany this paper.

SUMMARY

1. Apparatus has been devised for the study of air oxidations in liquid media of relatively high organic matter content.

2. Provision is made for the repeated withdrawal of samples for bacteriological and other examinations and for the maintenance of aerobic conditions throughout a series of tests.

3. A simplified technique based on the use of the Winkler reagents has been developed for the accurate determination of oxygen in small volumes of air.

4. The Winkler method has been modified to permit its use in determining the dissolved oxygen content of liquids containing large amounts of organic matter.

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A REPORT ON INFANT MORTALITY

REPORT OF THE CONFERENCE OF HEALTH EXPERTS ON THE PROTECTION OF EARLY INFANCY HELD AT ROME, ITALY, MARCH 25-28, 1929, ON THE RESULTS OF AN INTERNATIONAL INQUIRY CARRIED OUT UNDER THE AUSPICES OF THE HEALTH ORGANIZATION OF THE LEAGUE OF NATIONS.

In 1925, the Assembly of the League of Nations adopted the following resolution:

Considering that the council, in accordance with a resolution of the fifth assembly, invited the health organization of the league to consider any measures within its competence which it would be desirable and practicable to undertake for the protection of children from the hygienic point of view; and

Convinced of the importance of this form of child-welfare work; the assembly

Decides to request the health organization to investigate infant mortality from the point of view of feeding in infancy;

Requests the council to instruct the health committee to undertake this investigation and to inquire into the advisability of constituting a subcommittee which would be able to call upon the cooperation of specialists in various countries in questions concerning child hygiene and which would be requested to initiate the investigation of this and of any other questions connected with child hygiene the consideration of which might be deemed expedient.

In conformity with this resolution, the health committee instructed the medical director of the health organization to prepare a preliminary report on infant mortality and to select a small number of experts of public health administrations to indicate how the health organization could best undertake an international inquiry into this problem.

The following-named experts were asked to cooperate with the health committee:

Dame Janet Campbell, senior medical officer, British Ministry of Health, London, president.

Prof. A. Collett, specialist in children's diseases, Oslo.

Prof. R. Debré, hospital physician, Paris.

Prof. C. Gini, president of the Central Institute of Statistics of the Kingdom of Italy, Rome.

Prof. E. Gorter, director of the child clinic, University of Leyden.

Prof. Clemens Pirquet, child clinic, University of Vienna.

Prof. F. Rott, director of the State Institution for the Prevention of Infant Mortality, Berlin-Charlottenbourg.

Senior Surgeon Taliaferro Clark, United States Public Health Service.

The first meeting of the conference was held at Geneva, Switzerland, in September, 1926. At this meeting the conference decided to carry out a statistical and critical clinical inquiry on infant mortality in the different countries represented, and to study in each country two rural and two urban districts, each one representing a population of approximately 100,000. It was also decided to choose one rural district with a low infant mortality and one with a high infant mortality; also one urban district with a low infant mortality and one with a high infant mortality.

At a subsequent meeting of the conference, held at Paris, detailed plans regarding the scope and the methods of the inquiry were perfected with a view to obtaining accurate and authoritative information in each country in a manner to make the results statistically comparable.

After a preliminary investigation, an individual medical and social inquiry was begun in 26 districts of Europe, both urban and rural. The inquiry was entirely uniform as to method, and covered all children of less than 1 year of age who died during a period of 12 months. The same questionnaire, the same instructions, and the same kind of diagnosis were used throughout.

At the Rome meeting, national reports on the inquiry were received from Germany, Austria, France, Great Britain, Norway, and Holland. It is believed that the discussion and comparison of the principal results of the inquiry thus far, the conclusions arrived at, and the recommendations made by the conference with regard to infant mortality will be of decided interest to all investigators in this particular field.

Within a period of one year, 7,503 cases of infant deaths were investigated, of which 5,147 were live births and 2,356 were stillbirths.

For purposes of study, the conference decided to class the districts in the following order, the problem being found to be the same in districts having the same or similar mortality rates:

A. Rural districts

I. Low infant mortality, 3 to 4.9 per cent:
- Hedmark, Norway.
- Oxfordshire, England.

II. Moderate infant mortality, 5 to 6.9 per cent:
- Lochois and Chinonais, France.
- Lippe, Germany.
- Staffordshire, England.
- Emmen, Netherlands.

III. High infant mortality, 7 to 9.9 per cent:
- Caux Country, France.
- Bray Country, France.

IV. Very high infant mortality, 10 per cent and over:
- Hoensbroek, Netherlands.
- Gmunden, Austria.
- Strelitz, Germany.
- Scharding, Austria.

B. Urban districts

I. Low infant mortality, 3 to 4.9 per cent:
- West Oslo, Norway.
- Leyden, Netherlands.
- Dordrecht, Netherlands.
- Vienna (sixth, seventh, and eighth districts), Austria.

II. Moderate infant mortality, 5 to 6.9 per cent:
Croydon, England.
East Oslo, Norway.
Breda, Netherlands.
Maestricht, Netherlands.
III. High infant mortality, 7 to 9.9 per cent:
Cassel, Germany.
Plaisance and Zone, France.
Augsburg, Germany.
Sunderland, England.
IV. Very high infant mortality, 10 per cent and over:
Vienna (tenth district), Austria.

CAUSES OF DEATH ACCORDING TO MORTALITY RATE GROUP

It was found that the problems presented in each group in order of importance were as follows:

CLASS I

A. Deaths in relation to the prenatal period (premature birth, stillbirth), birth itself (obstetrical traumatism), and the post-natal period during which supervision is generally carried on by the obstetrician or the midwife. Deaths attributable to these causes represent almost two-thirds of the total mortality in the different districts.

B. Deaths from respiratory troubles which sometimes follow acute specific infectious diseases, but which, more often, are not associated with such a disease. These acute specific infectious diseases do not really represent a problem in these districts.

C. Some deaths from digestive troubles are reported in this group, but they play only a very small part.

CLASS II

A. Deaths in relation to the prenatal period (premature birth, stillbirth), birth itself (obstetrical traumatism), and the post-natal period are found here in the same degree as in Class I. If their importance is relatively less, it is only because a greater proportion of deaths are due to other causes.

B. Deaths from respiratory lesions. For these one may adopt an analogous conclusion. The absolute number of deaths attributable to this cause is about the same as in Class I, the importance of this element being less, apparently, because of the larger proportion of deaths from other causes.

In most of the districts in this class, the acute specific infectious diseases play a more important part in so far as concerns respiratory diseases than in the preceding class.

C. Deaths from digestive troubles, which have a very slight importance in the districts in Class I (except in one district—East Oslo), have here a greater importance.

CLASS III

Deaths from (*a*) digestive troubles in the rural as well as the urban districts and (*b*) acute specific infectious diseases.

The rôle of tuberculosis and syphilis begins to be more apparent than in the preceding class. The bad care to which infants are subjected may cause infections in different places, especially on the skin.

In these districts the deaths from respiratory troubles and deaths during the obstetrical period have a greater importance than in the preceding categories.

CLASS IV

In this last group the mortality from digestive troubles is of still greater importance. At the same time, a more significant number of deaths are reported from acute specific and nonspecific infectious diseases, premature birth, and accidents during the obstetrical period.

PRINCIPAL CAUSES OF INFANT MORTALITY

The following conclusions were reached with regard to the principal causes of infant mortality, constituting the most important problems in the different districts:

A. PRENATAL, NATAL AND DURING THE FIRST WEEK

1. Deaths during the first week are included in this group, for it is recognized that the same causes bring about death the first few days following birth as at the moment of birth.

2. One of the most striking things is the number of deaths from unknown causes. This number is so high that the greatest precaution must be taken in drawing conclusions. Some of the cases are classed under the heading "Cause unknown," because of lack of investigation (no autopsy); but there certainly still remain a large number of absolutely obscure deaths for which extended research has not reached any indication of the cause. These constitute a medical problem which is still to be solved.

3. The number of stillbirths varies in different districts in limited proportion. The differences are explained in part by the conditions under which the confinement took place, but they remain unexplained in a large number of cases.

4. In certain districts the diseases of the mother, notably gravid toxemia and uterine hemorrhages, are the important causes of the death of the infant.

5. Obstetrical traumatism, often connected with bad conditions of delivery and the absence of good obstetrical assistance, plays an important part. It must be noted, in certain districts, that the overexertion of the mother has been indicated as a cause of the death of

the infant at birth and during the first days; also the frequent ignorance of proper care, especially of premature births during the first 48 hours of life.

6. The experts have not been able to determine the causes of premature birth and have been impressed by the quickness with which death occurs in cases of this kind.

B. DISEASES OF THE RESPIRATORY SYSTEM

In infant mortality from this cause, the essential rôle seems to be played by contagion from grippe or an infection of the vital organs. In the districts with a high mortality, the rôle of environment seems to be more important than in the districts with a low mortality. In the first case, other factors, such as digestive troubles, leave the child in such a condition that it becomes the easy prey of an affection of the respiratory tract.

C. ACUTE SPECIFIC INFECTIOUS DISEASES

1. Among the infectious diseases of infancy, in almost all the districts under investigation, whooping cough played a more important part than measles.

2. The number of deaths from these two contagious diseases is appreciable, and a certain number classed under other headings may be due to these causes although they have not been recognized as such.

D. SYPHILIS AND TUBERCULOSIS

1. The importance of syphilis varies a little with the districts. The available information seems to indicate that this disease has not played an important part; but, in this field, the investigation has not furnished the exactness that might be desired.

2. Tuberculosis has caused a limited number of deaths.

E. DISEASES OF THE DIGESTIVE SYSTEM

1. The factor of mortality from diseases of the digestive system is the one that varies most according to districts, since it is the principal cause of death in the districts with high mortality and the one that is totally absent in sections with low mortality. It follows from this that of all causes it is the one most to be avoided.

2. In the districts where deaths from digestive troubles have been totally or almost totally eliminated, breast feeding is more general and, even though the hygienic and housing conditions are poor, artificial feeding is correctly carried on.

3. In the districts where the mortality is high, digestive troubles are apparent, not only because of the high mortality which is characteristic of them, but because they also contribute toward increasing the number of deaths under the other headings.

F. RELATION BETWEEN THE DEMOGRAPHIC, SOCIAL, AND ECONOMIC CONDITIONS AND THE RATE OF INFANT MORTALITY IN THE DIFFERENT DISTRICTS

1. It does not appear that the variations in the birth rate have an influence on the rate of infant mortality, since certain districts with a low mortality have a low birth rate and others a high birth rate; the same is true of districts with a high infant mortality.

The grouping of the population by age and sex not having been taken into consideration, definite conclusions can not be formulated until the birth rates have been corrected on the basis of a calculation of the coefficient of fecundity (number of live births in relation to the number of women of reproductive age).

2. The information on the social and housing conditions have furnished valuable indications for the study of each district and for the estimate of other factors which enter into the consideration of infant mortality. The conference has, nevertheless, experienced some difficulty in formulating general conclusions, because of the great number and complexity of the elements concerned and the hardly comparable character of the information reported on this subject.

It was decided that the information relative to these questions should be the object of further study.

RECOMMENDATIONS

The investigation has shown, on the one hand, the efficacy of certain measures taken, such as clinics for babies, maternal and infant surveillance, and certain social legislation. The insufficiency of these measures, on the other hand, has been demonstrated in all the districts.

Considering that, for certain causes, information is available as far as concerns preventive measures while for others the situation remains obscure, the recommendations should be divided into two groups, according to whether they treat of questions in which medical research is necessary or of questions of practical application.

A. MEDICAL RESEARCH

1. The investigation has shown that among the most important problems are those the rôle of which is of chief importance but which are still obscure. These are the problems of premature birth, stillbirth, and death during the first few days of life. These problems demand renewed scientific research to be undertaken by both obstetricians and pediatrists.

2. The etiology of affections of the respiratory system is well known, but new studies concerning their prevention should be undertaken by pediatrists and hygienists.

B. SUGGESTIONS OF A PRACTICAL NATURE WHICH THE INVESTIGATION HAS BROUGHT TO LIGHT

I. BATTLE AGAINST PREMATURE BIRTH, STILLBIRTH, AND OBSTETRICAL MORTALITY DURING THE FIRST DAYS OF LIFE

These recommendations concern not only the districts with low mortality in which they are the only real problems, but also, and even to a greater extent, the other classes of districts.

Medical surveillance of the mother during pregnancy.

1. Improvement of the medical surveillance of women during pregnancy, which is very important, ought to be adapted to conditions existing in towns and in the country. This surveillance seems to have been insufficient in the districts under investigation, even in those with low infant mortality.

2. Medical surveillance could be assured by clinics and by physicians and midwives who should receive special education.

3. There must be installed a great number of clinics for pregnant women in order to assure adequate medical surveillance for these women.

4. Medical surveillance of the mother involves a better comprehension on her part of the necessity of such surveillance from the beginning and during the entire course of her pregnancy.

5. It is also necessary to continue the battle against midwives and, in certain countries, to raise their standards.

6. Finally, there should be medical surveillance of working women during pregnancy.

Social and legislative aid to pregnant women.

1. Financial aid, assistance to pregnant women, and legislative measures, such as sickness insurance (including family insurance), should be developed to allow women to rest during the last months of their pregnancy—a method of avoiding premature birth and stillbirth.[1]

2. In most of the districts under investigation, the existing laws and financial assistance given are insufficient to allow pregnant women the necessary rest.

Measures pertaining to the confinement.

1. It is necessary to contend against midwives and perfect the obstetrical education of physicians and midwives.

2. The access of pregnant women to maternity hospitals must be made easier when there are sufficient medical and social reasons.

3. There is advantage in favoring the creation of small lying-in hospitals in the rural districts.

[1] As far as concerns social measures, they should apply equally to legitimate and illegitimate children.

Prevention of mortality during the first days of life.

Attention should be directed to the necessity of consulting medical specialists on the diseases of the newly born and on the necessity of improving the instruction of the public and of midwives as concerns the care given to infants during the first hours of life, especially to premature and weak infants.

II. CAMPAIGN AGAINST THE DISEASES OF THE RESPIRATORY SYSTEM

1. In addition to measures intended to insure better housing conditions, the prevention of mixed infection necessitates the improvement of the hygienic conditions and the medical surveillance of all the groups of children (hospitals, infant asylums, nurseries, etc.).

2. The public should be better informed on these diseases and on the danger of propagation from adults to small children, as well as on the way to avoid them.

III. CAMPAIGN AGAINST ACUTE SPECIFIC INFECTIOUS DISEASES

1. There is occasion to bring to the attention of physicians the dangers of whooping cough and measles and the necessity of using, in order to combat these diseases, the classic preventive measures (isolation) or the more recent measures (seroprophylaxis, vaccination).

2. It is necessary to endeavor in every way to apply to infants all the known preventive measures against syphilis and tuberculosis.

IV. MEASURES AGAINST DIGESTIVE TROUBLES

1. The success obtained in the districts with low mortality, in so far as it concerns this group of causes, clearly indicates the path to follow. It is necessary to continue the efforts begun in these districts and to apply them to the districts with high mortality. This effort consists in encouraging maternal feeding by propaganda, on the one hand, and by sufficient material assistance to mothers who nurse their children, on the other hand.

2. For the bottle-fed infants there should be developed all possible methods of protection by advising the mothers as well as by every other means.

3. Finally, measures should be taken for the supervision and improvement of the milk placed on sale.

V. MEASURES OF A GENERAL CHARACTER

These measures may be grouped as follows:

(*a*) Education of the public as regards hygiene.

(*b*) Education of the physicians and midwives as regards hygiene.

(*c*) Surveillance of infancy by visiting nurses.

(*a*) *Education of the public as regards hygiene.*

1. The education of the public comprises the teaching of certain hygienic ideas as regards small children, the teaching to extend to the elementary and secondary school programs.

2. The interest of instructors and professors particularly should be directed in this direction, especially where it concerns the feminine teaching personnel.

3. The creation of schools of hygiene which should not limit their instruction to physicians, midwives, and nurses, but which should be open to the general public. The education of the public should also be carried on by child clinics, which should be interested more especially in the instruction of mothers and treat more fully all matters concerned with the protection of early infancy.

(*b*) *Education of physicians and midwives as regards hygiene.*

This education includes not only that of student midwives and medical students, but also the systematic organization of complementary instruction for established physicians and midwives. In the medical schools, the physicians and midwives should be instructed in the practical difficulties which they are going to face. The teaching of pediatry, especially of the diseases of infants, should be compulsory.

(*c*) *Surveillance of infancy by visiting nurses.*

It follows from the investigation that it is altogether desirable for the children born in each district to be visited by a visiting nurse versed in physical and moral education. These nurses should encourage the mothers to apply to their physicians or to child clinics even before the appearance of the slightest trouble in the health of the infant, and they will guide the mothers in matters of hygiene and nourishment. Their work and that of the child clinics will exert an especially useful influence on certain classes of the population which act as islands of resistance as regards measures of hygiene recommended for infants.

If adequate measures are taken in regard to pregnant women and babies in the form of the establishment of clinics, the service of visiting nurses, legislation providing for the compulsory cessation of work with payment of a certain sum before and after confinement, as well as a bounty for nursing, a great number of women to whom this assistance is necessary will seek the benefits of their own free will.

All the central administrations of hygiene should take into consideration the advantages which such measures bring in the protection of mothers and children, and should develop them or encourage their development as rapidly as possible.

In consideration of the results of the investigation, it is of interest for the administrations of the different countries to carry on studies of the same kind which will serve as a basis for the establishment and application of preventive measures and which will complete the information on infant mortality furnished by the official statistics, the inadequacy of which the investigation has demonstrated in many districts.

Since the investigation has aroused a lively interest in all the districts in the prevention of infant mortality, it will also be of interest for the investigators to furnish periodically information on the different districts and on the progress which is subsequently being realized there.

The conference awaits with interest the results of the investigation in Italy, as well as the complete report of the investigations in Vanves and in the German districts which cover all the live births, as well as the stillbirths and other infant deaths, and asks the health committee to endeavor, in addition to the publication of a general report, to undertake or assist in the publication of national reports so that the detailed results can be brought to the attention of all those who are particularly interested in the prevention of infant mortality, including the public.

DEATHS DURING WEEK ENDED SEPTEMBER 7, 1929

Summary of information received by telegraph from industrial insurance companies for the week ended September 7, 1929, and corresponding week of 1928. (From the Weekly Health Index, September 12, 1929, issued by the Bureau of the Census, Department of Commerce)

	Week ended Sept. 7, 1929	Corresponding week, 1928
Policies in force	74, 345, 451	71, 654, 862
Number of death claims	10, 347	10, 127
Death claims per 1,000 policies in force, annual rate	7. 3	7. 4

(*a*) *Education of the public as regards hygiene.*

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Deaths from all causes in certain large cities of the United States during the week ended September 7, 1929, infant mortality, annual death rate, and comparison with corresponding week of 1928. (From the Weekly Health Index, September 12, 1929, issued by the Bureau of the Census, Department of Commerce)

City	Week ended Sept. 7, 1929		Annual death rate per 1,000, corresponding week, 1928	Deaths under 1 year		Infant mortality rate, week ended Sept. 7, 1929 [2]
	Total deaths	Death rate [1]		Week ended Sept. 7, 1929	Corresponding week, 1928	
Total (62 cities)	6,205	11.1	10.2	724	674	[3] 63
Akron	32			5	7	52
Albany [4]	40	17.4	10.9	6	2	119
Atlanta	63	12.9	14.3	4	11	42
White	35			3	4	
Colored	28	(5)	(5)	1	7	
Baltimore [4]	174	11.0	13.0	20	24	64
White	131			13	16	52
Colored	43	(5)	(5)	7	8	111
Birmingham	63	14.8	16.7	7	14	63
White	25			2	8	30
Colored	38	(5)	(5)	5	6	115
Boston	192	12.6	11.3	29	25	80
Bridgeport	27			4	4	69
Buffalo	145	13.6	10.8	23	13	99
Cambridge	18	7.5	8.3	2	0	36
Camden	25	9.7	8.5	1	5	17
Canton	11	4.9	8.5	3	2	71
Chicago [4]	595	9.9	9.3	49	78	44
Cincinnati	149			12	15	70
Cleveland	209	10.8	7.4	22	13	65
Columbus	80	14.0	13.5	3	7	28
Dallas	47	11.3	8.9	5	8	
White	34			5	6	
Colored	13	(5)	(5)	0	2	
Dayton	39	11.1	6.5	5	6	79
Denver	79	14.0	14.9	19	7	183
Des Moines	23	7.9	9.6	2	1	36
Detroit	290	11.0	9.3	62	41	100
Duluth	21	9.4	11.6	3	0	72
Erie	15			0	3	0
Fall River [4]	15	5.8	11.7	1	1	19
Flint	26	9.1	13.7	8	11	97
Fort Worth	37	11.3	10.4	5	2	
White	31			3	1	
Colored	6	(5)	(5)	2	1	
Grand Rapids	25	8.0	8.0	2	2	30
Houston	56			6	5	
White	36			5	5	
Colored	20	(5)	(5)	1	0	
Indianapolis	113	15.5	11.2	17	10	136
White	88			12	7	111
Colored	25	(5)	(5)	5	3	299
Jersey City	52	8.4	10.5	9	14	70
Kansas City, Kans	17	7.5	8.0	0	4	0
White	11			0	3	0
Colored	6	(5)	(5)	0	1	0
Kansas City, Mo	85	11.4	13.8	6	13	51
Knoxville	19	9.4	12.9	1	5	22
White	13			0	5	0
Colored	6	(5)	(5)	1	0	211
Los Angeles	294			27	10	79
Louisville	62	9.8	10.8	6	9	49
White	53			4	8	37
Colored	9	(5)	(5)	2	1	126
Lowell	21			3	5	68
Lynn	17	8.4	4.5	0	0	0
Memphis	50	13.7	16.2	4	11	47
White	47			4	11	76
Colored	3	(5)	(5)	0	0	0
Milwaukee	99	9.5	8.9	17	9	75
Minneapolis	79	9.1	8.0	9	4	56
Nashville	49	18.4	11.6	5	3	81
White	28			4	2	87
Colored	21	(5)	(5)	1	1	63
New Bedford	14			1	4	21
New Haven	34	9.5	5.8	2	4	31

Footnotes at end of table.

Deaths from all causes in certain large cities of the United States during the week ended September 7, 1929, infant mortality, annual death rate, and comparison with corresponding week of 1928—Continued

City	Week ended Sept. 7, 1929		Annual death rate per 1,000, corresponding week, 1928	Deaths under 1 year		Infant mortality rate, week ended Sept. 7, 1929 [2]
	Total deaths	Death rate [1]		Week ended Sept. 7, 1929	Corresponding week, 1928	
New Orleans	130	15.8	16.6	15	15	74
White	83			7	8	49
Colored	47	(3)	(3)	8	7	135
New York	1,299	11.3	9.7	146	134	60
Bronx Borough	176	9.7	8.1	24	14	71
Brooklyn Borough	413	9.4	8.7	56	47	57
Manhattan Borough	503	15.0	13.1	52	62	64
Queens Borough	156	9.5	6.9	9	9	37
Richmond Borough	51	17.7	13.9	5	2	91
Newark, N. J	96	10.6	12.9	8	16	42
Oklahoma City	30			2	4	40
Omaha	42	9.9	8.0	4	3	47
Paterson	38	13.7	6.1	7	0	124
Philadelphia	418	10.6	10.3	48	54	68
Pittsburgh	152	11.8	9.8	23	15	79
Portland, Oreg	62			4	3	46
Providence	48	8.8	8.0	1	6	9
Richmond	47	12.6	10.5	5	6	70
White	27			3	2	64
Colored	20	(3)	(3)	2	4	82
Rochester	66	10.5	8.9	5	1	42
St. Louis	161	9.9	11.5	13	12	44
St. Paul	42			2	3	21
Salt Lake City [4]	22	8.3	8.7	4	2	62
San Antonio	49	11.7	9.6	12	6	
San Diego	32			1	1	19
San Francisco	141	12.6	12.9	7	7	45
Schenectady	21	11.8	11.2	1	2	32
Seattle	66	9.0	9.0	2	2	21
Somerville	17	8.7	6.6	3	0	108
Spokane	30	14.4	15.8	0	1	0
Springfield, Mass	30	10.5	7.3	1	4	17
Syracuse	64	16.8	10.2	6	4	72
Tacoma	24	11.4	9.9	0	1	0
Toledo	65	10.9	9.5	9	3	84
Trenton	33	12.4	17.3	2	2	36
Washington, D. C	127	12.0	9.0	24	7	141
White	64			9	2	76
Colored	63	(3)	(3)	15	5	284
Waterbury	16			3	0	76
Wilmington, Del	28	11.4	9.0	8	3	208
Worcester	40	10.6	11.4	5	2	63
Yonkers	29	12.5	9.1	4	4	93
Youngstown	29	8.7	9.9	4	3	57

[1] Annual rate per 1,000 population.
[2] Deaths under 1 year per 1,000 births. Cities left blank are not in the registration area for births.
[3] Data for 71 cities.
[4] Deaths for week ended Friday.
[5] In the cities for which deaths are shown by color, the colored population in 1920 constituted the following percentages of the total population: Atlanta, 31; Baltimore, 15; Birmingham, 39; Dallas, 15; Fort Worth, 14; Houston, 25; Indianapolis, 11; Kansas City, Kans., 14; Knoxville, 15; Louisville, 17; Memphis, 38; Nashville, 30; New Orleans, 26; Richmond, 32; and Washington, D. C., 25.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary and the figures are subject to change when later returns are received by the State health officers

Reports for Weeks Ended September 7, 1929, and September 8, 1928

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended September 7, 1929, and September 8, 1928

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928
New England States:								
Maine		1			4	12	0	0
New Hampshire	3				1	6	0	0
Vermont	1				3		0	0
Massachusetts	43	25	2	3	22	23	1	0
Rhode Island	2	2				9	0	0
Connecticut	4	16	1	2	3	13	0	0
Middle Atlantic States:								
New York	71	87	[1] 7	[1] 6	137	121	14	17
New Jersey	37	48	3	4	9	10	9	6
Pennsylvania	68	79			49	61	12	12
East North Central States:								
Ohio	29	20	10	8	27	20	2	4
Indiana	23	19		9	6	4	1	0
Illinois	106	48	6	10	31	14	6	6
Michigan	46	38			48	15	33	2
Wisconsin	21	9	7	8	24	19	1	4
West North Central States:								
Minnesota	8	17	4	2	4	4	2	1
Iowa	4	3			2		1	0
Missouri	14	31	3		1	15	4	0
North Dakota	4	7		9	20		7	0
South Dakota	1	2			2	1	0	0
Nebraska	9	16					0	0
Kansas	10	9	1	1	9	5	1	0
South Atlantic States:								
Delaware							0	0
Maryland [2]	14	13	5	2	2	10	0	3
District of Columbia	8	8		1			0	0
Virginia								
West Virginia	17	22	7	8	1	13	3	0
North Carolina	136	72			3	16	1	0
South Carolina	54	30	265	209		1	0	0
Georgia	18	16	30	49			0	0
Florida	12	13		49	1	6	0	1

[1] New York City only.

[2] Week ended Friday.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended September 7, 1929, and September 8, 1928—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928
East South Central States:								
Kentucky	----	3	----	----	----	9	0	0
Tennessee	----	17	----	13	3	2	2	0
Alabama	49	32	2	39	6	5	0	1
Mississippi	40	18	----	----	----	----	1	----
West South Central States:								
Arkansas	3	3	2	23	----	10	0	0
Louisiana	26	11	23	4	4	7	0	0
Oklahoma [1]	22	25	19	49	4	7	0	1
Texas	52	16	14	25	3	1	0	0
Mountain States:								
Montana	2	2	----	----	1	1	0	1
Idaho	----	----	----	----	3	----	0	0
Wyoming	----	----	----	----	7	2	0	0
Colorado	6	8	----	----	4	4	2	2
New Mexico	4	4	----	----	----	1	0	0
Arizona	4	----	----	----	----	2	3	1
Utah [2]	----	1	4	1	----	----	1	0
Pacific States:								
Washington	7	12	----	----	9	11	2	3
Oregon	3	10	----	3	4	5	0	0
California	26	44	7	24	28	12	9	2

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928
New England States:								
Maine	0	2	16	2	0	0	----	2
New Hampshire	0	2	1	4	0	0	1	0
Vermont	0	7	----	3	0	0	3	0
Massachusetts	8	33	55	70	0	0	12	12
Rhode Island	0	1	1	6	0	0	2	3
Connecticut	0	4	5	3	0	0	1	2
Middle Atlantic States:								
New York	36	101	55	60	1	1	62	57
New Jersey	2	2	23	18	0	0	19	24
Pennsylvania	9	10	77	66	3	0	49	46
East North Central States:								
Ohio	10	18	85	48	33	8	68	43
Indiana	1	0	25	23	10	5	17	18
Illinois	6	4	88	55	15	7	24	31
Michigan	19	7	48	27	23	8	7	16
Wisconsin	1	2	26	44	4	5	18	3
West North Central States:								
Minnesota	0	11	37	30	6	0	7	12
Iowa	3	6	15	8	5	0	10	4
Missouri	1	0	19	24	8	3	9	21
North Dakota	0	3	8	7	1	0	1	2
South Dakota	0	2	4	2	4	1	4	1
Nebraska	0	6	7	10	14	2	3	5
Kansas	0	2	14	34	7	3	24	18
South Atlantic States:								
Delaware	0	0	----	0	0	0	1	1
Maryland [2]	0	30	25	4	0	0	16	46
District of Columbia	1	2	11	2	0	0	4	3
Virginia	19	----	----	----	----	----	----	----
West Virginia	5	27	18	28	3	9	41	31
North Carolina	3	2	74	51	1	8	56	54
South Carolina	2	0	9	14	0	1	66	67
Georgia	1	0	20	11	0	0	33	32
Florida	0	0	2	4	0	1	1	6

[1] Week ended Friday.
[2] Figures for 1929 are exclusive of Oklahoma City and Tulsa and for 1928 are exclusive of Tulsa only.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended September 7, 1929, and September 8, 1928—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928	Week ended Sept. 7, 1929	Week ended Sept. 8, 1928
East South Central States:								
Kentucky	0	0	37	16	0	4	50	16
Tennessee	1	1	----	22	1	0	53	85
Alabama	8	1	28	9	0	2	21	48
Mississippi	0	0	18	16	1	0	29	47
West South Central States:								
Arkansas	0	0	9	4	0	0	25	40
Louisiana	0	0	4	7	2	0	19	37
Oklahoma [3]	0	0	18	9	4	6	63	115
Texas	3	1	32	12	14	0	36	24
Mountain States:								
Montana	1	6	5	5	1	1	5	5
Idaho	0	1	----	2	3	0	2	1
Wyoming	0	3	4	8	0	1	2	3
Colorado	0	3	7	6	7	1	19	4
New Mexico	0	0	4	2	0	0	9	8
Arizona	1	0	0	1	0	0	2	0
Utah [2]	0	0	2	0	1	0	0	0
Pacific States:								
Washington	0	33	17	11	15	15	8	9
Oregon	0	1	4	14	10	10	6	5
California	4	6	61	39	5	15	18	15

[2] Week ended Friday.
[3] Figures for 1929 are exclusive of Oklahoma City and Tulsa and for 1928 are exclusive of Tulsa only.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of monthly State reports is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
July, 1929										
Delaware	----	5	----	2	16	----	1	3	0	4
District of Columbia	0	19	1	----	18	1	0	34	0	11
Mississippi	0	51	379	----	135	2,089	6	24	2	333
Rhode Island	0	26	1	----	112	----	1	22	0	5
August, 1929										
Arkansas	----	15	15	724	3	115	0	27	13	99
Connecticut	4	52	8	1	67	----	6	47	0	23
District of Columbia	3	37	3	----	5	----	1	15	0	10
Nebraska	2	12	----	1	128	----	0	36	26	9
Wyoming	3	3	----	----	5	----	0	5	3	5

July, 1929

	Cases
Chicken pox:	
Delaware	6
District of Columbia	10
Mississippi	278
Rhode Island	20
Dengue:	
Mississippi	26
Dysentery:	
Mississippi (amebic)	72
Mississippi (bacillary)	2,167
Hookworm disease:	
Mississippi	423
Lethargic encephalitis:	
District of Columbia	1
Mumps:	
Delaware	3
Mississippi	182
Rhode Island	3
Ophthalmia neonatorum:	
Mississippi	12
Rhode Island	4
Paratyphoid fever:	
Rhode Island	1
Puerperal septicemia:	
Mississippi	24
Rabies in animals:	
Mississippi	6
Rhode Island	5

Septic sore throat:	Cases
Rhode Island	1
Trachoma:	
Mississippi	7
Rhode Island	2
Whooping cough:	
Delaware	9
District of Columbia	42
Mississippi	1,284
Rhode Island	56

August, 1929

Anthrax:	
Connecticut	1
Chicken pox:	
Arkansas	22
Connecticut	92
District of Columbia	9
Nebraska	14
Wyoming	5
Dysentery:	
Connecticut (bacillary)	1
Favus:	
Connecticut	1
German measles:	
Connecticut	15
Hookworm disease:	
Arkansas	8
Lead poisoning:	
Connecticut	1
Lethargic encephalitis:	
Connecticut	2
District of Columbia	2
Nebraska	1
Mumps:	Cases
Arkansas	31
Connecticut	15
Nebraska	15
Wyoming	3
Ophthalmia neonatorum:	
Arkansas	2
Paratyphoid fever:	
Arkansas	3
Connecticut	3
Nebraska	1
Rabies in animals:	
Connecticut	3
Rocky Mountain spotted or tick fever:	
Wyoming	5
Septic sore throat:	
Connecticut	3
Nebraska	3
Wyoming	3
Trachoma:	
Arkansas	4
Connecticut	1
Typhus fever:	
Arkansas	8
Undulant fever:	
Nebraska	1
Whooping cough:	
Arkansas	88
Connecticut	107
District of Columbia	41
Nebraska	125
Wyoming	4

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 96 cities reporting cases used in the following table are situated in all parts of the country and have an estimated aggregate population of more than 31,405,000. The estimated population of the 89 cities reporting deaths is more than 29,830,000. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

Weeks ended August 31, 1929, and September 1, 1928

	1929	1928	Estimated expectancy
Cases reported			
Diphtheria:			
46 States	1,021	827	
96 cities	372	333	470
Measles:			
45 States	474	613	
96 cities	86	128	
Meningococcus meningitis:			
45 States	84	83	
96 cities	60	48	
Poliomyelitis:			
46 States	124	334	
Scarlet fever:			
46 States	840	727	
96 cities	245	190	273
Smallpox:			
46 States	149	148	
96 cities	25	3	4
Typhoid fever:			
46 States	832	1,122	
96 cities	163	169	192
Deaths reported			
Influenza and pneumonia:			
89 cities	326	333	
Smallpox:			
89 cities	0	0	

City reports for week ended August 31, 1929

The "estimated expectancy" given for diphtheria, poliomyelitis, scarlet fever, smallpox, and typhoid fever is the result of an attempt to ascertain from previous occurrence the number of cases of the disease under consideration that may be expected to occur during a certain week in the absence of epidemics. It is based on reports to the Public Health Service during the past nine years. It is in most instances the median number of cases reported in the corresponding weeks of the preceding years. When the reports include several epidemics, or when for other reasons the median is unsatisfactory, the epidemic periods are excluded and the estimated expectancy is the mean number of cases reported for the week during non-epidemic years.

If the reports have not been received for the full nine years, data are used for as many years as possible, but no year earlier than 1920 is included. In obtaining the estimated expectancy, the figures are smoothed when necessary to avoid abrupt deviation from the usual trend. For some of the diseases given in the table the available data were not sufficient to make it practicable to compute the estimated expectancy.

Division, State, and city	Population July 1, 1928, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
NEW ENGLAND									
Maine:									
Portland	78,600	1	0	0		0	1	0	1
New Hampshire:									
Concord	(1)	0	0	0		0	0	0	0
Nashua	(1)	0	0	0		0	0	0	3
Vermont:									
Barre	(1)	1	0	0		0	0	0	0
Massachusetts:									
Boston	790,200	9	23	7		0	6	8	10
Fall River	134,300	0	1	0		0	0	0	1
Springfield	149,800	0	1	8		0	0	0	0
Worcester	197,000	0	3	2		0	2	1	1
Rhode Island:									
Pawtucket	73,100	0	0	0		0	0	0	1
Providence	286,300	0	3	2		0	0	0	4
Connecticut:									
Bridgeport	(1)	3	3	1		0	0	0	0
Hartford	172,300	3	3	0	1	0	0	0	3
New Haven	187,900	1	1	0		0	0	0	1
MIDDLE ATLANTIC									
New York:									
Buffalo	555,800	1	9	9		0	2	0	7
New York	6,017,500	10	83	67	3	3	9	21	74
Rochester	328,200	1	4	3		0	0	1	1
Syracuse	199,300	7	2	0		0	0	0	1
New Jersey:									
Camden	135,400	0	2	0		0	0	0	0
Newark	473,600	9	6	19	2	0	2	3	5
Trenton	139,000	1	1	0		0	0	0	1
Pennsylvania:									
Philadelphia	2,064,200	8	29	9	1	1	2	9	19
Pittsburgh	673,800	1	11	5	1	1	1	2	16
Reading	115,400	0	1	0		0	0	0	2
EAST NORTH CENTRAL									
Ohio:									
Cincinnati	413,700	1	4	5		0	0	0	8
Cleveland	1,010,300	5	21	10	1	0	4	0	15
Columbus	299,000	0	2	0		0	1	0	2
Toledo	313,200	0	5	3	1	0	1	1	3
Indiana:									
Fort Wayne	105,300	0	1	0		0	0	0	0
Indianapolis	382,100	0	2	1		1	0	0	3
South Bend	86,100	0	1	1		0	0	0	0
Terre Haute	73,500	0	0	0		0	0	0	0
Illinois:									
Chicago	3,157,400	7	44	73	3	2	13	3	29
Springfield	67,200	0	0	0	1	0	0	0	0
Michigan:									
Detroit	1,378,900	0	26	22	2	0	7	5	16
Flint	148,800	1	2	1		0	2	0	1
Grand Rapids	164,200	0	2	0		0	2	0	1

[1] No estimate of population made.

City reports for week ended August 31, 1929—Continued

Division, State, and city	Population July 1, 1928, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
EAST NORTH CENTRAL—continued									
Wisconsin:									
Kenosha	56,500	1	0	0		0	0	0	1
Madison	50,500	1	1	0		0	2	0	0
Milwaukee	544,200	2	7	4		0	4	3	4
Racine	74,400	2	0	0		0	0	0	0
Superior	(1)	0	0	0		0	1	0	0
WEST NORTH CENTRAL									
Minnesota:									
Duluth	116,800	0	0	0		0	0	0	1
Minneapolis	455,900	2	12	1		0	0	2	2
St. Paul	(1)	1	8	0		0	0	1	1
Iowa:									
Davenport	(1)	0	0	1			0	0	
Des Moines	151,900	0	1	0			0	0	
Sioux City	80,000	0	0	0			2	1	
Waterloo	37,100	0	0	0			0	0	
Missouri:									
Kansas City	391,000	1	2	1		0	1	1	2
St. Joseph	78,500	0	0	0		0	1	0	0
St. Louis	848,100	1	19	8			0	2	
North Dakota:									
Fargo	(1)	0	0	0		0	0	0	1
Grand Forks	(1)	0	0	0			1	0	
South Dakota:									
Sioux Falls	(1)	0	0	0			0	0	
Nebraska:									
Omaha	222,800	1	6	3		0	0	1	0
Kansas:									
Topeka	62,800	0	0	0		0	0	3	3
Wichita	99,300	0	2	0		0	0	0	1
SOUTH ATLANTIC									
Delaware:									
Wilmington	128,500	0	1	0		0	0	0	1
Maryland:									
Baltimore	830,400	3	14	9		0	0	3	11
Cumberland	(1)	0	0	0		0	0	0	0
Frederick	(1)	0	1	0		0	0	0	0
District of Columbia:									
Washington	552,000	1	7	6		0	2	0	5
Virginia:									
Lynchburg	38,600	0	1	2		0	1	2	0
Richmond	194,400	0	9	5		0	3	1	2
Roanoke	64,600	0	3	5		0	0	0	0
West Virginia:									
Charleston	55,200	0	1	0		0	0	0	0
Wheeling	(1)	1	1	1		0	0	0	1
North Carolina:									
Raleigh	(1)	0	1	4		0	0	0	1
Wilmington	39,100	1	0	3		0	0	0	1
Winston-Salem	80,000	0	2	4		0	1	2	0
South Carolina:									
Charleston	75,900	0	1	0	17	0	0	0	3
Columbia	50,600	0	1	3		0	0	0	2
Georgia:									
Atlanta	255,100	0	4	1	2	1	0	0	1
Brunswick	(1)	0	0	0		0	0	0	0
Savannah	99,900	0	0	5	6	0	0	0	0
Florida:									
Miami	156,700	0	1	4		0	0	0	0
St. Petersburg	53,300								
Tampa	113,400	0	1	0		0	0	0	2

[1] No estimate of population made.

City reports for week ended August 31, 1929—Continued

Division, State, and city	Population July 1, 1928, estimated	Chickenpox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
EAST SOUTH CENTRAL									
Kentucky:									
Covington	59,000	0	0	0	----	0	0	0	1
Louisville	329,400	1	3	6	----	0	0	0	4
Tennessee:									
Memphis	190,200	0	2	8	----	0	0	1	2
Nashville	139,000	0	3	1	----	0	1	0	0
Alabama:									
Birmingham	222,400	0	4	3	----	0	0	0	4
Mobile	69,600	----	0	----	----	----	----	----	----
Montgomery	63,100	0	1	2	----	----	0	0	----
WEST SOUTH CENTRAL									
Arkansas:									
Fort Smith	(1)	0	0	0	----	----	0	0	----
Little Rock	79,200	0	0	0	----	0	0	1	4
Louisiana:									
New Orleans	429,400	0	6	11	----	0	0	0	8
Shreveport	81,300	0	0	1	----	0	0	0	1
Oklahoma:									
Tulsa	170,500	0	0	4	----	----	2	0	----
Texas:									
Dallas	217,800	1	5	10	1	0	2	0	1
Fort Worth	170,600	0	2	2	----	0	0	0	3
Galveston	50,600	0	0	0	----	0	0	0	1
Houston	(1)	0	2	9	----	0	0	0	6
San Antonio	218,100	0	1	5	----	1	0	0	4
MOUNTAIN									
Montana:									
Billings	(1)	1	0	0	----	0	1	0	0
Great Falls	(1)	0	0	0	----	0	1	2	0
Helena	(1)	0	0	0	----	0	0	3	0
Missoula	(1)	0	0	0	----	0	0	0	0
Idaho:									
Boise	(1)	0	0	0	----	0	1	0	0
Colorado:									
Denver	294,200	2	10	2	----	1	2	2	4
Pueblo	44,200	1	1	0	----	0	0	1	0
New Mexico:									
Albuquerque	(1)	0	1	0	----	0	0	0	1
Utah:									
Salt Lake City	138,000	1	2	0	----	0	0	7	1
Nevada:									
Reno	(1)	0	0	0	----	0	0	0	0
PACIFIC									
Washington:									
Seattle	383,200	6	2	2	----	----	0	5	----
Spokane	109,100	2	1	0	----	----	1	0	----
Tacoma	110,500	0	1	1	----	----	0	0	----
Oregon:									
Portland	(1)	1	4	1	----	0	0	1	2
Salem	(1)	0	0	0	----	0	0	2	0
California:									
Los Angeles	(1)	2	23	4	2	0	2	10	6
Sacramento	75,700	0	2	0	----	0	0	0	0
San Francisco	585,300	8	10	4	2	0	5	12	3

[1] No estimate of population made.

City reports for week ended August 31, 1929—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
NEW ENGLAND											
Maine:											
Portland	1	0	0	0	0	1	1	1	0	1	16
New Hampshire:											
Concord	0	0	0	0	0	0	0	0	0	0	5
Nashua	0	0	0	0	0	0	0	0	0	0	11
Vermont:											
Barre	0	0	0	0	0	1	0	0	0	5	1
Massachusetts:											
Boston	14	12	0	0	0	14	3	4	1	14	182
Fall River	0	0	0	0	0	1	1	0	0	3	18
Springfield	1	1	0	0	0	1	0	0	0	1	27
Worcester	2	1	0	0	0	1	0	1	0	8	40
Rhode Island:											
Pawtucket	0	0	0	0	0	1	0	0	0	0	14
Providence	2	2	0	0	0	2	2	3	0	3	61
Connecticut:											
Bridgeport	2	0	0	0	0	1	0	0	0	1	30
Hartford	1	1	0	0	0	2	0	2	0	5	43
New Haven	2	0	0	0	0	1	3	2	0	6	58
MIDDLE ATLANTIC											
New York:											
Buffalo	4	8	0	0	0	4	2	0	0	16	135
New York	25	15	0	0	0	88	44	47	4	57	1,157
Rochester	2	0	0	0	0	4	2	0	0	2	----
Syracuse	2	1	0	0	0	0	1	1	0	30	43
New Jersey:											
Camden	0	0	0	0	0	1	1	0	0	1	29
Newark	4	1	0	0	0	7	1	3	0	58	78
Trenton	0	0	0	0	0	3	1	0	0	3	31
Pennsylvania:											
Philadelphia	18	5	0	0	0	25	10	4	0	73	407
Pittsburgh	9	4	0	0	0	7	2	2	0	33	160
Reading	0	0	0	0	0	1	0	0	0	18	23
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	4	9	0	0	0	5	3	2	0	2	123
Cleveland	11	9	0	0	0	12	4	3	1	61	155
Columbus	3	2	0	0	0	1	0	0	0	11	39
Toledo	3	1	0	0	0	2	2	1	0	16	70
Indiana:											
Fort Wayne	1	2	0	9	0	0	1	0	0	1	16
Indianapolis	2	2	0	0	0	2	2	1	0	0	80
South Bend	1	2	0	0	0	1	0	0	0	0	9
Terre Haute	1	3	0	0	0	1	0	0	0	1	9
Illinois:											
Chicago	25	33	0	0	0	43	7	8	0	110	600
Springfield	0	1	0	0	0	1	0	2	0	8	17
Michigan:											
Detroit	24	24	0	0	0	26	5	3	0	55	275
Flint	4	2	0	6	0	0	2	0	0	4	27
Grand Rapids	3	4	0	0	0	1	0	1	0	4	30
Wisconsin:											
Kenosha	1	0	0	0	0	1	0	0	0	0	9
Madison	1	0	1	0	0	0	0	1	0	7	----
Milwaukee	7	4	0	0	0	4	1	0	0	54	101
Racine	2	2	0	1	0	1	0	0	0	1	17
Superior	0	0	1	0	0	0	0	0	0	1	7
WEST NORTH CENTRAL											
Minnesota:											
Duluth	4	1	1	0	0	1	0	0	0	4	22
Minneapolis	13	4	0	0	0	1	2	1	1	5	71
St. Paul	5	3	0	0	0	5	1	0	0	23	50
Iowa:											
Davenport	1	1	0	4	----	----	0	0	----	0	----
Des Moines	2	4	0	0	----	----	0	0	----	0	22
Sioux City	0	0	0	0	----	----	0	0	----	25	----
Waterloo	0	1	0	2	----	----	0	0	----	0	----

City reports for week ended August 31, 1929—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST NORTH CENTRAL—contd.											
Missouri:											
Kansas City	2	7	0	0	0	9	2	1	0	8	90
St. Joseph	1	0	0	0	0	1	0	0	0	0	16
St. Louis	10	2	0	0	0	10	7	3	0	27	206
North Dakota:											
Fargo	1	3	0	0	0	0	0	0	0	2	11
Grand Forks	1	2	0	0	----	----	0	0	----	0	----
South Dakota:											
Sioux Falls	1	0	0	1	----	----	0	2	----	0	4
Nebraska:											
Omaha	1	0	0	0	0	2	1	1	0	1	56
Kansas:											
Topeka	2	1	0	0	0	0	0	0	0	6	18
Wichita	1	1	0	0	0	1	2	6	0	2	41
SOUTH ATLANTIC											
Delaware:											
Wilmington	0	0	0	0	0	1	1	1	0	2	19
Maryland:											
Baltimore	5	5	0	0	0	18	10	9	0	40	183
Cumberland	0	0	0	0	0	[1] 1	1	0	0	0	10
Frederick	0	0	0	0	0	0	1	0	0	0	2
District of Columbia:											
Washington	4	5	0	0	0	5	4	2	1	12	117
Virginia:											
Lynchburg	0	0	0	0	0	1	1	0	0	18	12
Richmond	3	0	0	0	0	4	2	0	0	4	34
Roanoke	1	1	0	0	0	3	1	0	0	1	14
West Virginia:											
Charleston	1	1	0	0	0	0	1	2	0	2	----
Wheeling	1	0	0	0	0	0	0	0	0	1	13
North Carolina:											
Raleigh	0	2	0	0	0	1	0	0	0	0	10
Wilmington	0	0	0	0	0	2	0	0	0	0	10
Winston-Salem	1	3	0	0	0	0	2	1	0	4	13
South Carolina:											
Charleston	1	0	0	0	0	3	3	0	0	5	27
Columbia	0	1	0	0	0	0	1	1	0	1	6
Georgia:											
Atlanta	4	5	0	0	0	3	4	10	0	1	45
Brunswick	0	0	0	0	0	0	0	0	0	0	2
Savannah	0	0	0	0	0	6	1	2	0	0	26
Florida:											
Miami	0	0	0	0	0	1	0	1	0	2	16
Tampa	1	1	0	0	0	1	1	0	0	0	16
EAST SOUTH CENTRAL											
Kentucky:											
Covington	0	0	0	0	0	3	1	0	0	0	23
Louisville	2	7	0	1	0	4	4	2	1	7	63
Tennessee:											
Memphis	1	1	0	0	0	4	6	1	0	6	67
Nashville	1	0	0	0	0	0	6	7	0	4	----
Alabama:											
Birmingham	3	4	0	0	0	3	6	5	0	3	85
Mobile	0	----	1	----	----	----	1	----	----	----	----
Montgomery	0	0	0	0	----	----	1	0	----	0	----
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith	0	2	0	0	----	----	0	0	----	0	----
Little Rock	0	0	0	1	0	6	1	3	0	0	----
Louisiana:											
New Orleans	1	4	0	0	0	9	4	2	0	4	130
Shreveport	0	2	0	0	0	0	1	0	0	0	17

[1] Nonresident.

City reports for week ended August 31, 1929—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST SOUTH CENTRAL—contd.											
Oklahoma:											
Tulsa	0	1	0	0	----	----	2	3	----	6	----
Texas:											
Dallas	2	6	0	0	0	1	3	2	1	3	36
Fort Worth	1	0	0	1	0	0	1	3	1	0	30
Galveston	0	0	0	0	0	0	0	0	0	0	11
Houston	2	2	0	0	0	4	1	6	0	0	60
San Antonio	2	3	0	0	0	3	2	0	0	0	52
MOUNTAIN											
Montana:											
Billings	0	0	0	0	0	1	0	0	0	0	3
Great Falls	0	0	0	0	0	1	1	0	0	0	6
Helena	0	0	0	0	0	0	0	1	0	0	2
Missoula	0	0	0	0	0	0	0	0	0	2	6
Idaho:											
Boise	0	0	0	0	0	0	0	0	0	0	8
Colorado:											
Denver	3	0	0	0	0	10	1	0	1	8	76
Pueblo	0	0	0	0	0	1	0	1	0	0	9
New Mexico:											
Albuquerque	0	0	0	0	0	5	0	0	0	0	14
Utah:											
Salt Lake City	1	7	0	0	0	0	1	0	0	6	28
Nevada:											
Reno	0	0	0	0	0	0	0	0	0	0	2
PACIFIC											
Washington:											
Seattle	3	2	0	1	----	----	2	2	----	11	----
Spokane	2	2	0	1	----	----	0	0	----	5	----
Tacoma	0	0	1	1	0	0	1	1	1	0	19
Oregon:											
Portland	2	1	4	0	0	1	0	2	0	0	68
Salem	0	0	0	0	0	0	0	0	0	1	----
California:											
Los Angeles	7	5	1	3	0	22	4	2	1	17	187
Sacramento	1	2	0	0	0	0	1	0	0	0	17
San Francisco	5	8	0	0	0	7	1	0	0	14	157

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
NEW ENGLAND									
Massachusetts:									
Boston	1	1	0	0	0	0	4	1	1
MIDDLE ATLANTIC									
New York:									
Buffalo	3	3	0	0	0	0	0	0	0
New York	8	5	0	0	0	0	14	0	0
Rochester	0	0	0	0	0	0	0	2	1
Syracuse	0	0	0	0	0	0	1	6	2
New Jersey:									
Newark	1	1	3	0	0	0	0	2	0
Pennsylvania:									
Philadelphia	7	3	0	0	0	0	1	1	1
Pittsburgh	0	1	0	1	0	0	0	1	1

City reports for week ended August 31, 1929—Continued

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
EAST NORTH CENTRAL									
Ohio:									
Cleveland	2	0	0	0	0	1	1	6	3
Columbus	1	1	0	0	0	0	0	0	0
Indiana:									
Indianapolis	0	2	0	0	0	0	0	0	0
Terre Haute	2	0	0	0	0	0	0	0	0
Illinois:									
Chicago	0	1	0	0	0	0	5	2	0
Michigan:									
Detroit	12	6	1	1	0	0	*1	7	0
Wisconsin:									
Milwaukee	1	1	1	0	0	0	0	0	0
WEST NORTH CENTRAL									
Minnesota:									
Minneapolis	1	0	0	1	0	0	0	1	1
St. Paul	1	0	0	0	0	0	1	1	0
Iowa:									
Des Moines	0	0	0	0	0	0	0	3	0
Missouri:									
Kansas City	1	0	0	0	0	1	0	0	0
St. Louis	5	3	0	0	0	0	1	0	0
North Dakota:									
Fargo	0	1	0	0	0	0	0	0	0
Nebraska:									
Omaha	0	0	0	0	0	0	1	1	0
SOUTH ATLANTIC									
Maryland:									
Baltimore	0	1	1	1	0	0	1	0	0
District of Columbia:									
Washington	0	1	0	0	0	0	0	0	0
Virginia:									
Richmond	0	0	0	0	0	0	0	6	0
Roanoke	0	0	0	0	0	0	0	5	0
West Virginia:									
Charleston	1	0	0	0	0	0	0	0	0
Wheeling	1	0	0	0	0	0	0	0	0
North Carolina:									
Winston-Salem	0	0	0	0	0	1	0	0	0
South Carolina:									
Charleston	1	1	0	0	8	1	0	0	0
Georgia:									
Atlanta	0	0	0	0	0	1	0	0	0
Savannah [1]	0	0	0	0	3	0	0	0	0
Florida:									
Miami [1]	0	0	0	0	2	1	0	0	0
Tampa	1	0	0	0	0	0	0	0	0
EAST SOUTH CENTRAL									
Tennessee:									
Memphis	0	0	0	0	0	1	0	1	0
Nashville	1	0	0	0	0	0	1	0	0
Alabama:									
Birmingham	0	0	0	0	1	0	1	0	0
WEST SOUTH CENTRAL									
Louisiana:									
New Orleans	0	0	0	0	2	1	0	0	0
Shreveport	0	0	0	0	0	1	0	0	0
Texas:									
Forth Worth [1]	0	0	0	0	0	1	1	0	0
Houston	0	0	0	0	0	0	1	3	1

[1] Typhus fever: 4 cases; 2 cases at Savannah, Ga., 1 case at Miami, Fla., and 1 case at Fort Worth, Tex.

City reports for week ended August 31, 1929—Continued

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
MOUNTAIN									
Colorado:									
Denver	1	1	0	0	0	0	0	0	0
Utah:									
Salt Lake City	4	2	0	0	0	0	1	0	0
PACIFIC									
Washington:									
Spokane	1	0	0	0	0	0	0	0	0
Oregon:									
Portland	0	0	0	0	0	0	0	1	0
California:									
Los Angeles	1	1	0	0	0	0	1	2	0
Sacramento	1	1	0	0	0	0	0	0	0
San Francisco	1	0	0	0	5	0	0	0	0

The following table gives the rates per 100,000 population for 98 cities for the 5-week period ended August 31, 1929, compared with those for a like period ended September 1, 1928. The population figures used in computing the rates are approximate estimates, authoritative figures for many of the cities not being available. The 98 cities reporting cases have an estimated aggregate population of more than 31,000,000. The 91 cities reporting deaths have nearly 30,000,000 estimated population. The number of cities included in each group and the estimated aggregate populations are shown in a separate table below.

Summary of weekly reports from cities, July 28 to August 31, 1929—Annual rates per 100,000 population, compared with rates for the corresponding period of 1928 [1]

DIPHTHERIA CASE RATES

	Week ended—									
	Aug. 3, 1929	Aug. 4, 1928	Aug. 10, 1929	Aug. 11, 1928	Aug. 17, 1929	Aug. 18, 1928	Aug. 24, 1929	Aug. 25, 1928	Aug. 31, 1929	Sept. 1, 1928
98 cities	67	[2] 65	[3] 64	61	62	55	[4] 61	65	[5] 62	[6] 57
New England	54	57	45	60	38	48	63	62	45	37
Middle Atlantic	67	67	70	60	59	55	58	66	54	59
East North Central	99	73	[7] 85	73	86	59	69	67	75	[8] 61
West North Central	25	66	31	59	23	57	25	65	25	51
South Atlantic	47	55	[9] 32	54	47	67	[4] 79	86	90	73
East South Central	34	28	[9] 30	14	81	49	54	49	[5] 105	35
West South Central	99	41	[10] 126	53	126	45	146	65	142	101
Mountain	9	35	35	35	44	27	26	44	17	44
Pacific	47	[2] 84	45	69	32	46	30	41	27	20

[1] The figures given in this table are rates per 100,000 population, annual basis, and not the number of cases reported. Populations used are estimated as of July 1, 1929, and 1928, respectively.
[2] Seattle and Spokane, Wash., not included.
[3] Indianapolis, Ind., Richmond, Va., Montgomery, Ala., and Fort Smith, Ark., not included.
[4] Charleston, W. Va., and Savannah, Ga., not included.
[5] Mobile, Ala., not included.
[6] South Bend, Ind., not included.
[7] Indianapolis, Ind., not included.
[8] Richmond, Va., not included.
[9] Montgomery, Ala., not included.
[10] Fort Smith, Ark., not included.

Summary of weekly reports from cities, July 28 to August 31, 1929—Annual rates per 100,000 population, compared with rates for the corresponding period of 1928—Continued

MEASLES CASE RATES

	Week ended—									
	Aug. 3, 1929	Aug. 4, 1928	Aug. 10, 1929	Aug. 11, 1928	Aug. 17, 1929	Aug. 18, 1928	Aug. 24, 1929	Aug. 25, 1928	Aug. 31, 1929	Sept. 1, 1928
98 cities	49	[2] 99	[3] 30	59	24	37	[4] 21	29	[5] 14	[6] 22
New England	97	527	32	248	29	64	38	85	20	90
Middle Atlantic	35	79	15	51	15	40	13	21	8	16
East North Central	83	84	[7] 56	63	35	39	33	31	22	[6] 28
West North Central	38	14	33	18	13	22	8	16	8	4
South Atlantic	11	59	[8] 10	23	15	33	[4] 0	34	13	4
East South Central	7	28	[9] 7	35	0	28	14	14	[5] 7	14
West South Central	8	0	[10] 20	4	24	28	4	0	8	0
Mountain	26	97	61	44	52	44	52	9	44	31
Pacific	45	[2] 30	25	20	47	8	40	31	20	18

SCARLET FEVER CASE RATES

98 cities	40	[2] 46	[3] 44	37	39	30	[4] 41	34	[5] 41	[6] 32
New England	63	53	52	67	50	39	45	30	38	64
Middle Atlantic	24	28	23	21	17	21	15	18	16	14
East North Central	62	58	[7] 72	42	50	37	62	44	63	[6] 32
West North Central	35	68	44	68	40	61	56	49	44	55
South Atlantic	28	38	[8] 44	27	73	17	[4] 32	34	45	33
East South Central	34	35	[9] 15	49	14	14	68	63	[5] 37	91
West South Central	40	77	[10] 41	36	40	16	67	53	75	45
Mountain	9	27	44	18	78	27	44	62	61	35
Pacific	50	[2] 67	57	38	55	36	52	33	47	31

SMALLPOX CASE RATES

98 cities	7	[2] 4	[3] 5	1	7	1	[4] 3	2	[5] 4	[6] 1
New England	0	0	0	0	0	0	0	0	0	0
Middle Atlantic	0	0	0	0	3	0	0	0	0	0
East North Central	13	7	[7] 12	1	16	1	4	5	10	[6] 1
West North Central	6	0	10	2	4	0	6	0	4	0
South Atlantic	0	2	[8] 0	2	0	0	[4] 0	0	0	0
East South Central	7	21	[9] 7	0	7	0	0	0	[5] 0	0
West South Central	4	0	[10] 0	0	0	0	8	0	4	0
Mountain	26	35	0	9	9	0	26	9	0	0
Pacific	35	[2] 10	17	8	12	3	17	0	15	5

TYPHOID FEVER CASE RATES

98 cities	19	[2] 21	[3] 17	27	20	27	[4] 29	31	[5] 27	[6] 29
New England	11	5	14	16	11	16	27	16	29	23
Middle Atlantic	11	17	11	15	19	17	34	22	27	18
East North Central	10	10	[7] 12	14	5	18	12	18	13	[6] 15
West North Central	33	8	15	25	6	41	13	25	23	39
South Atlantic	22	42	[8] 24	57	39	36	[4] 36	52	52	46
East South Central	149	154	[9] 44	245	122	98	102	231	[5] 97	175
West South Central	55	61	[10] 65	73	47	97	91	53	51	73
Mountain	9	0	9	9	61	35	70	62	17	44
Pacific	20	[2] 27	30	15	17	26	5	26	12	26

[2] Seattle and Spokane, Wash., not included.
[3] Indianapolis, Ind., Richmond, Va., Montgomery, Ala., and Fort Smith, Ark., not included.
[4] Charleston, W. Va., and Savannah, Ga., not included.
[5] Mobile, Ala., not included.
[6] South Bend, Ind., not included.
[7] Indianapolis, Ind., not included.
[8] Richmond, Va., not included.
[9] Montgomery, Ala., not included.
[10] Fort Smith, Ark., not included.

Summary of weekly reports from cities, July 28 to August 31, 1929—Annual rates per 100,000 population, compared with rates for the corresponding period of 1928—Continued

INFLUENZA DEATH RATES

	Week ended—									
	Aug. 3, 1929	Aug. 4, 1928	Aug. 10, 1929	Aug. 11, 1928	Aug. 17, 1929	Aug. 18, 1928	Aug. 24, 1929	Aug. 25, 1928	Aug. 31, 1929	Sept. 1, 1928
91 cities	3	6	[11] 1	5	3	3	[4] 3	4	[5] 2	[6] 3
New England	0	2	0	0	0	2	2	2	0	0
Middle Atlantic	2	6	1	5	2	0	3	3	2	3
East North Central	4	3	[7] 1	1	2	4	4	3	2	[6] 3
West North Central	0	3	6	6	3	0	0	0	0	3
South Atlantic	4	15	[8] 0	8	0	0	[9] 2	10	2	4
East South Central	15	0	0	15	22	0	0	0	[5] 0	8
West South Central	8	12	8	29	12	29	8	17	4	4
Mountain	9	0	0	9	17	0	9	0	9	18
Pacific	0	10	0	0	3	10	0	3	0	3

PNEUMONIA DEATH RATES

91 cities	54	53	[11] 53	59	57	55	[4] 54	58	[5] 55	[6] 56
New England	43	57	38	48	52	37	25	44	50	30
Middle Atlantic	61	60	60	72	71	66	60	68	61	61
East North Central	47	31	[7] 41	33	35	42	47	41	51	[6] 30
West North Central	26	70	45	80	33	46	48	52	33	46
South Atlantic	45	52	[8] 44	54	62	59	[9] 79	61	56	75
East South Central	96	38	59	69	89	77	37	115	[5] 58	100
West South Central	81	87	126	108	81	58	69	87	101	67
Mountain	61	62	61	71	35	62	52	44	44	53
Pacific	52	76	43	57	75	61	52	51	30	40

[4] Charleston, W. Va., and Savannah, Ga., not included.
[5] Mobile, Ala., not included.
[6] South Bend, Ind., not included.
[7] Indianapolis, Ind., not included.
[8] Richmond, Va., not included.
[11] Indianapolis, Ind., and Richmond, Va., not included.

Number of cities included in summary of weekly reports and aggregate population of cities of each group, approximated as of July 1, 1929 and 1928, respectively

Group of cities	Number of cities reporting cases	Number of cities reporting deaths	Aggregate population of cities reporting cases		Aggregate population of cities reporting deaths	
			1929	1928	1929	1928
Total	98	91	31,568,400	31,052,700	29,995,100	29,498,600
New England	12	12	2,305,100	2,273,900	2,305,100	2,273,900
Middle Atlantic	16	16	10,809,700	10,702,200	10,809,700	10,702,200
East North Central	16	16	8,181,900	8,001,300	8,181,900	8,001,300
West North Central	12	9	2,712,100	2,673,300	1,736,900	1,708,100
South Atlantic	19	19	2,783,200	2,732,900	2,783,200	2,732,900
East South Central	6	5	767,900	745,500	704,200	682,400
West South Central	8	7	1,319,100	1,289,900	1,285,000	1,256,400
Mountain	9	9	598,800	590,200	598,800	590,200
Pacific	6	4	2,090,600	2,043,500	1,590,300	1,551,200

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—Week ended August 24, 1929.—The Department of Pensions and National Health reports cases of certain communicable diseases from seven Provinces of Canada for the week ended August 24, 1929, as follows:

Disease	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal fever		1	3			1		5
Poliomyelitis	1	5	34	1	1	1	1	44
Smallpox							1	1
Typhoid fever	2	19	29	1	4	1	2	58

CHINA

Manchuria—Plague.—A report dated August 22, 1929, from the North Manchurian Plague-Prevention Service states that plague appeared in July in Wu Chia Tze, an isolated village 16 miles north of Tungliao. Nine deaths occurred between July 22 and 26. The diagnosis was not confirmed. On August 8, three cases of bubonic plague were found.

Unconfirmed reports of plague infection were received early in August from villages north and northwest of Chien Chia Tien. Floods made it impracticable to reach these places.

Reports of plague in the vicinity of Nungan were being investigated.

CUBA

Habana—Communicable diseases—August, 1929.—During the month of August, 1929, certain communicable diseases were reported in the city of Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Chicken pox	4		Rabies	1	1
Diphtheria	10	1	Scarlet fever	1	
Malaria [1]	15		Tuberculosis	91	27
Measles	7		Typhoid fever [1]	47	9

[1] Many of these cases are from the interior.

GREAT BRITAIN

England and Wales—Vital statistics—April–June, 1929.—During the second quarter of the year 1929, 169,612 births and 118,761 deaths were registered in England and Wales, giving a birth rate, on an annual basis, of 17.2 per 1,000 population and a death rate of 12.1 per 1,000. The figures are provisional. The deaths of infants under 1 year of age equalled 62 per 1,000 live births.

During the 13 weeks ended June 29, 1929, deaths from certain communicable diseases were reported in 107 county boroughs and great towns, including Greater London, as follows:

Disease	Deaths	Deaths per 1,000 population	Disease	Deaths	Deaths per 1,000 population
Diarrhea and enteritis (under two years)	595		Scarlet fever	71	0.01
Diphtheria	357	0.07	Smallpox	16	
Influenza	1,339	.27	Typhoid fever	37	
Measles	779	.16	Whooping cough	977	.20

Deaths from certain communicable diseases were reported in 157 smaller towns for the quarter ended June 30, 1929, as follows:

Disease	Deaths	Disease	Deaths
Diarrhea and enteritis (under 2 years)	72	Scarlet fever	26
Diphtheria	67	Smallpox	7
Influenza	502	Typhoid fever	4
Measles	88	Whooping cough	208

Estimated population, 5,072,000.

England and Wales—Communicable diseases—Thirteen weeks ended June 29, 1929.—During the 13 weeks ended June 29, 1929, cases of certain communicable diseases were reported in England and Wales as follows:

Disease	Cases	Disease	Cases
Diphtheria	12,691	Puerperal pyrexia	1,363
Ophthalmia neonatorum	1,444	Scarlet fever	24,196
Pneumonia	16,851	Smallpox [1]	3,639
Puerperal fever	603	Typhoid fever	507

[1] During the second quarter of the year 1929, 24 deaths from smallpox were reported in England and Wales.

JAPAN

Lethargic encephalitis.—Under date of September 10, 1929, 877 cases of lethargic encephalitis with 20 deaths were reported in Japan. The disease appeared late in August, chiefly in Shikoku and Chugoku districts. Eleven prefectures were affected.

MEXICO

Vera Cruz—Communicable diseases—Six weeks ended August 10, 1929.—During the six weeks ended August 10, 1929, deaths from certain communicable diseases were reported at Vera Cruz, Mexico, as follows:

Disease	Week ended—					
	July 6	July 13	July 20	July 27	Aug. 3	Aug. 10
Bronchitis			1		1	2
Cancer	1		1	1		2
Cerebrospinal meningitis	2	1	1	1		1
Erysipelas	1				1	
Gastrointestinal disorders	13	12	11	6	4	1
Hookworm disease	1			2	1	
Jaundice		1			1	
Lethargic encephalitis					1	
Malaria	4	1	4	1		2
Pneumonia	1		1	1	3	2
Syphilis			1			
Tetanus			1	1	1	
Tuberculosis	2	5	5	8	3	12
Typhoid fever			1	1	1	2

Tampico—Communicable diseases—July, 1929.—During the month of July, 1929, certain communicable diseases were reported in Tampico, Mexico, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	1		Typhoid fever	5	2
Enteritis (various)	5	60	Typhus fever	1	
Malaria	53	17	Whooping cough	6	2
Tuberculosis	45	32			

NETHERLANDS

Rotterdam—Smallpox—July–August, 1929.—From the beginning of the outbreak (in July, 1929) to August 24, 1929, 196 cases of smallpox (alastrim) with 5 deaths were notified in the Netherlands. Of these, 173 cases and all of the deaths occurred in Rotterdam.

PANAMA CANAL ZONE

Communicable diseases—January–June, 1929.—During the six months from January to June, 1929, certain communicable diseases were reported in the Panama Canal Zone and terminal cities, as follows:

Disease	January		February		March		April		May		June	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chicken pox	12		22		22		21		17		23	
Diphtheria	39	1	30		21		26	2	48	1	76	
Dysentery, amebic	6	1	5	3	8	1	10	1	14	1	7	
Dysentery, bacillary	3	1	2	1	2	1			1	1	1	
Leprosy	1	1	1		2		1		1			1
Malaria	127	3	93	1	108	2	111	3	120	1	227	1
Measles	99	2	46	2	84	1	35	1	15		46	1
Meningococcus meningitis					3		2	2	2		2	1
Mumps	123		89		109		90		79		43	
Pneumonia		33		34		31		26		30		1
Poliomyelitis	1						1					
Relapsing fever					1							
Scarlet fever					1						1	
Smallpox	7						1				1	
Trachoma			1									
Tuberculosis		21		34		19		27		27		33
Typhoid fever	7	1	3		[1] 2		[2]		3	1		
Paratyphoid fever	3		1	1								
Whooping cough	2		2		7		4		6		17	

[1] 2 typhoid carriers in addition to the 2 cases. [2] 1 typhoid carrier.

VIRGIN ISLANDS

Communicable diseases—July, 1929.—During the month of July, 1929, cases of certain communicable diseases were reported in the Virgin Islands, as follows:

St. Thomas and St. John:	Cases
Gonorrhea	1
Measles	1
Syphilis	7
Tuberculosis	1
St. Croix:	
Leprosy	1

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Hygiene, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following table must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		Feb. 10–Mar. 9, 1929	Mar. 10–Apr. 6, 1929	Apr. 7–May 4, 1929	May 5–June 1, 1929	June 2–29, 1929	Week ended— July, 1929 6	13	20	27	August, 1929 3	10	17	24	31	Sept. 7, 1929
Ceylon	C	4			3											
	D	4			3											
Colombo	C			1	3	1										
	D				3	1										
China:																
Amoy	C					4	1	2	4		1					
Canton	C		3	3	2	10	3	1		2	1	2	2			
	D			3	1	5	3	1		1	1		2			
Manchuria:																
Kwantung—Dairen	C											1				
Newchwang	C												797	500	483	
Shanghai	C						1		1					29		
	D								1	2	4	24				
Swatow	C					P										
	D					4	2	1	3	1	2	5	3			
India	C	7,627	9,046	18,521	30,616	29,449	7,315	6,946								
	D	4,425	4,997	11,069	20,311	19,910	4,783	4,431								
Bassein	D	6	45	118	38	2					3	3	3			
Bombay	C		6	3		2					1					
	D	1	2		2	2					1					
Calcutta	C	261	552	788	924	354	82	69	59							
	D	144	307	461	605	176	41	29	59	28	24	28		18		
Karachi	C											1	3	6		
Madras	C	9			1											
	D	4							1	1						
Moulmein	D	1	7	6	31	5			1							
Negapatam	C	3				1			1			4				
Rangoon	C	13	15	8	13	8			1		1					
	D	6	37	10	7	8			1		1					
Tuticorin	C	6				34	4	2								
	D	4				30		2								
Vizagapatam	D								1							

India (French):																
Chandernagor	C		3	3	3	3	1	1				1				
	D		3	1	3	3	1			1						
Karikal	C	88	20	3								1				
	D	71	15	3												
Pondicherry Province	C	86	46		3	3										
	D	74	38		3	3										
Indo-China (see also table below):																
Pnompenh	C	42	13	15	14	11	2	2	3				1	2		
	D	36	10	9	10	4	1	1	2	1			1	2		
Saigon and Cholon	C		12	13	71	188	0	6		2						
	D		2	8	37	139	8	4	1	1						
Japan:																
Kobe	C												P	2	4	
Osaka	C												1	4		
Shimonoseki	C													P		
Siam	C	165	397	619	619	469	214	49	54	54		29	13			
	D	117	269	404	436	285	112	38	26	26		17	10			
Anthoang	C	3								4				10		
	D	2								4				3		
Ayudhaya	C	4	1	29	2	25			6	11		2				
	D	4	1	19		11			3	8						
Bangkok	C	61	38	111	131	30	2	2	1	2		2		4		
	D	36	21	74	77	13		1						1		
Chaxoengsao	C	1			1											
	D	1			1											
Dhannapuri	C	3		17												
	D	1		7												
Lobpuri	C	3		1										2		
	D	1		1										2		
Nagara Pathom	C	2		36	13											
	D	2		20	10											
Singhapuri	C	1														
	D	1														
Smud Prakar	C	1														
Smud Songram	C								2	1						
	D								2	1						
Sridharmaraj Province [1]	C										2	13				
	D										2	11				

[1] There were 98 cases of cholera with 16 deaths in Nagara Sridharmaraj Province, Siam, from May 16 to July 7, 1929.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

CHOLERA—Continued

[C indicates cases; D, deaths; P, present]

Place		Feb. 10–Mar. 9, 1929	Mar. 10–Apr. 6, 1929	Apr. 7–May 4, 1929	May 5–June 1, 1929	June 2–29, 1929	Week ended— July, 1929: 6	13	20	27	August, 1929: 3	10	17	24	31	Sept. 7, 1929
On vessel:																
S. S. Angby, at Saigon-Cholon	C					1										
	D					1										
S. S. Cap. St. Jacques, at Singapore, from Saigon-Cholon	C						P									
S. S. Ekma, at Penang from Singapore	C	P														
S. S. Elephanta, at Penang from Calcutta	C		P													
S. S. Erinpura, at Madras	C				2											
S. S. Media, at Colombo from Calcutta	C				1											
S. S. Saka Maru, at Calcutta	C				6											
S. S. Tilawa, at Penang from Singapore	C		P													
S. S. Tokushima, at Hong Kong	C					2										
	D					2										
S. S. Texas Maru, at Nagasaki from Shanghai	C												1			

Place		February, 1929	March, 1929	April, 1929	May, 1929	June, 1929: 1–10	11–20	21–30	July, 1929: 1–10	11–20	21–31	August, 1929: 1–10	11–20
Indo-China (French) (see also table above):													
Annam	C		6	20	[1] 20				2	5	2		3
Cambodia	C	69	29	84	[1] 215				55	71	60		21
Cochin-China	C	223	183	88	[1] 123				146	123	46		45
Laos	C								1		12		
Tonkin	C				5								

[1] Reports incomplete.

PLAGUE

Place		Week ended— Feb. 10–Mar. 9, 1929	Mar. 10–Apr. 6, 1929	Apr. 7–May 4, 1929	May 5–June 1, 1929	June 2–29, 1929	July, 1929: 6	13	20	27	August, 1929: 3	10	17	24	31	Sept. 7, 1929
Algeria: Philippeville	C									3	3					
Argentina:																
Buenos Aires	C		2	1												
	D		2													
Rosario	C		31	5												
Azores: St. Michaels Island	C		1						1							
Belgian Congo:																
Blukwa	C					3										
	D					3										
Buki	C						1	1								
	D						1	1								
Djugu	C	4			2	3				5			1			
	D	1			3	3				5			1			
Rekwa	C						2									
	D						2									
Brazil: Porto Alegre	C			1												
British East Africa (see also table below):																
Uganda	C	112	130	231	450	1,437	255									
	D	108	124	219	409	1,072	220									
Canary Islands: Tenerife	D							1								
Laguna	C				1											
Ceylon:																
Colombo	C	4	4	5	7	2		P	P							
	D	3	1	4	6	3										
Plague-infected rats		2		1				1		5						
Galle	C							1	1	1					P	
	D							1	1	1						
Kandy	C													1	1	
	D													1	1	
Matara	C							7	4	1						
	D							3	3	5						
China:																
Amoy	C										P					
Hainan	C	1														
Hong Kong	C													1		
Plague-infected rats														3		
Manchuria—Tungliao District	C									P	13	3				
Suyuan Province	C	1														

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place		Feb. 10–Mar. 9, 1929	Mar. 10–Apr. 6, 1929	Apr. 7–May 4, 1929	May 5–June 1, 1929	June 2–29, 1929	Week ended— July, 1929 6	13	20	27	August, 1929 3	10	17	24	31	Sept. 7, 1929
Dutch East Indies:																
Java—																
Batavia and West Java	C	70	64	63	58	47	.....	12	15	.....	.....	.....	.....	.....	.....	.....
	D	69	65	63	56	47	.....	11	16	.....	.....	.....	.....	.....	.....	.....
Plague-infected rats		4	5	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
East Java and Madura	C	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	D	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Surabaya	C	.....	.....	.....	.....	3	2	5	.....	.....	.....	.....	.....	.....	.....	.....
	D	.....	.....	.....	.....	3	2	5	.....	.....	.....	.....	.....	.....	.....	.....
Ecuador (see table below).																
Egypt:																
Alexandria	C	.....	.....	.....	1	1	2	.....	3	2	1	.....	1	3	3	.....
	D	.....	.....	.....	.....	1	1	.....	1	1	.....	.....	.....	.....	1	.....
Assuan	C	.....	.....	.....	.....	.....	.....	1	1	2	.....	.....	.....	.....	.....	.....
	D	.....	.....	.....	.....	.....	.....	1	1	2	.....	.....	.....	.....	.....	.....
Beheira	C	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....
	D	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....
Beni Suef	C	4	2	7	.....	6	1	1	1	1	1	.....	.....	.....	.....	.....
	D	1	2	2	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Daqahliya	C	.....	.....	.....	9	1	.....	.....	.....	1	.....	.....	1	.....	.....	.....
	D	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gharbia	C	.....	.....	.....	.....	.....	1	5	1	2	.....	.....	1	.....	.....	.....
	D	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....	.....
Girga	C	.....	.....	.....	.....	.....	2	1	.....	.....	.....	.....	.....	.....	.....	.....
Kena	C	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....
	D	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....
Menufia Province	C	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....
Miniah	C	.....	.....	.....	.....	.....	.....	.....	4	3	.....	.....	1	.....	.....	.....
Port Said	C	.....	.....	2	3	2	1	1	1	.....	2	1	2	1	2	.....
	D	.....	.....	1	2	1	1	.....	.....	1	1	.....	3	.....	3	.....
Suez	C	1	2	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....
Greece (see also table below):																
Patras	C	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....
Piræus	C	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1

Hawaii: Hamakua—Kukuihaele—Plague-infected rats						6	1									
India	C	16,570	16,011	6,884	1,394	677	222	366								
	D	12,064	12,592	5,623	1,205	414	120	236								
Bassein	C			1				3		6	4	3		4		
	D	3	6	2	2	4	1				5	3		4		
Bombay	C	4	8	8	1						1					
	D	4	6	6	1	4					1					
Plague-infected rats		38	57	81	44	35	6	7	4	6	7			3		
Madras Presidency	C	333	132	38	64	85	43		54		29					
	D	189	80	14	40	38	26		26		18					
Rangoon	C	4	12	11	2		2			4	5					
	D	4	9	15	3	9	3	3	8	4	5			2		
Plague-infected rats		11	15	10	5	6	4	2	3					10		
Indo-China (see also table below):																
Pnompenh	C	5	10	8	5	4	5		2		1	5	2		1	
	D	3	10	8	3	3	5			3	1	5	2		1	
Saigon and Cholon	C	1				1	5			1	2	1		1		
Tourane	C	5														
Iraq:																
Baghdad	C	10	11	8	14	12		1				1	1			
	D	3	3	7	5	2										
Plague-infected rats		22	14	2	1											
Diyalah Liwa	C			7	12	1	1									
	D			7	7											
Naudham	C					1		1								
Japan: Osaka—Plague-infected rats					2											
Madagascar (see also table below):																
Tamatave	C				P	2	2	2		1						
	D	2	1	1		2										
Plague-infected rats						4										
Morocco	C		106	31	42	16	3	21	15					4		
	D		73	16	4	5		11	6							
Nigeria: Lagos	C	11	4	8	5	2			1			1	2			
	D	11	4	8	4	1			1			1	2			
Plague-infected rats		50	18	6	8	4	2	2	5							
Peru (see table below).																
Senegal (see table below).																
Siam	C	9	9	10	9	1			4							
	D	9	8	8	5	1			3							
Bangkok	C	1			2				1			3				P
	D	1			1				1			3				
Nagara Pathom	C	3	4	2	3											
	D	2	4	2	2											
Straits Settlements: Singapore	C	1		1												
	D	1		1	1											
Tunisia: Tunis	C							P	P	P						
Turkey:																
Adalia	C											1				
Constantinople	C					P			2							

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place		Feb. 10–Mar. 9, 1929	Mar. 10–Apr. 6, 1929	Apr. 7–May 4, 1929	May 5–June 1, 1929	June 2–29, 1929	Week ended— July, 1929 6	13	20	27	August, 1929 3	10	17	24	31	Sept. 7, 1929
Union of Socialist Soviet Republics:																
Caucasia	C					1	3	1		3		2				
	D					1	3					1				
Ural—Kirghiz	C					4										
	D					4										
Union of South Africa:																
Cape Province	C		1	2					3							
	D		1	1					2							
Orange Free State	C	2	3	4												
	D		2	1												
Transvaal	C		8													
	D		8													
Uruguay: Montevideo	C		4													
On vessel:																
S. S. Chenonceaux, at Singapore, from Colombo	C		1													
	D		1													
S. S. Tokio, at Shanghai, from Singapore	C									1						
	D									1						
S. S. Ganzan Maru, at Osaka, from Haipong	C				1											
S. S. Seigo Maru, at Osaka, from Bombay—Plague-infected rats					1											
S. S. Soudades, at Hamburg, from Rosario, Argentina—Plague-infected rats				2												
S. S. Sumatra, at Osaka, from Bombay	C			1	1											

Place		March, 1929	April, 1929	May, 1929	June, 1929	July, 1929	August, 1929
British East Africa (see also table above):							
Kenya	C	10	4	22	69	.....	.....
Uganda	C	121	282	.....	.....	.....	.....
	D	113	264	.....	.....	.....	.....
Ecuador: Guayaquil	C	26	19	2	.....	.....	.....
	D	4	5	1	.....	.....	.....
Plague-infected rats		14	13	3	1	.....	.....
Greece	C	.....	1	.....	.....	3	.....
	D	.....	.....	.....	.....	1	.....
Indo-China (see also table above)	C	3	13	.....	.....	42	.....
Madagascar (see also table above)	C	196	92	.....	.....	.....	.....
	D	194	88	.....	.....	.....	.....
Ambositra Province	C	90	8	.....	.....	.....	.....
	D	90	8	.....	.....	.....	.....
Antisirabe Province	C	13	.....	.....	.....	.....	.....
	D	13	.....	.....	.....	.....	.....
Itasy Province	C	8	2	.....	.....	.....	.....
	D	7	2	.....	.....	.....	.....
Moramanga Province	C	5	3	.....	.....	.....	.....
	D	5	3	.....	.....	.....	.....
Tananarive Province	C	120	78	.....	11	.....	.....
	D	119	74	.....	11	.....	.....
Peru	C	35	.....	10	16	11	.....
	D	13	.....	5	8	3	.....
Senegal:							
Baol [1]	C	6	1	21	43	22	5
	D	3	1	6	18	9	1
Dakar [1]	C	.....	6	17	67	62	20
	D	.....	4	11	45	45	20
Louga [1]	C	.....	.....	.....	.....	59	46
	D	.....	.....	.....	.....	39	31
Rufisque [1]	C	.....	.....	.....	.....	22	.....
	D	.....	.....	.....	.....	7	.....
Thies [1]	C	4	20	6	10	61	17
	D	3	20	3	6	34	10
Tivaouane [1]	C	.....	.....	22	93	161	86
	D	.....	.....	10	50	96	58

[1] Incomplete reports.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX

[C indicates cases; D, deaths; P, present]

Place		Feb. 10–Mar. 9, 1929	Mar. 10–Apr. 6, 1929	Apr. 7–May 4, 1929	May 5–June 1, 1929	Week ended— June, 1929				July, 1929				August, 1929				
						8	15	22	29	6	13	20	27	3	10	17	24	31
Algeria:																		
Algiers	C		3	5	5	1	2	2	1	1	2	2	2		1			
Cherchell	C	21	42	1				1										
Oran	C	1	1	2	5	1							1					
Angola (see table below).																		
Arabia: Aden	C		30	69	40	20	25	10	55	18	21	42	22	11	17	6	4	
	D		8	20	20	2	6	6	6	18	4	17	17	20	10	4	3	
Australia: Fremantle Quarantine Station	C												1					
Bermuda: Hamilton	C					1												
Brazil:																		
Porto Alegre	C				1													
Rio de Janeiro	C				3													
British East Africa (see also table below):																		
Tanganyika	C	3		3	4				7	2	2	2						
British South Africa:																		
Northern Rhodesia	C											73						
	D											4						
Southern Rhodesia	C	17	69	13	12							5						
Canada:																		
Alberta	C	5	7	8		8	3	1						1	2	1		
Calgary	C	1		2										1	1			
Edmonton	C	2	12	5			3	1								1		
British Columbia—Vancouver	C	70	64	46	23	1	2	4	6	4	8	2		5		2		
Manitoba	C	15	3	12	6	6						1						
Winnipeg and vicinity	C						2											
New Brunswick	C		3															
Nova Scotia	C			1										2				
Ontario	C	83	57	113	40	15	39	21	9	25	5	13	14		2	5		
Niagara Falls	C		1		3													
North Bay	C	4		3	8		2			2	2	2	1					
Ottawa	C	1						1					1		1			
Toronto	C		2	1			1	4		5		1	1					1
Windsor	C			3	3	1		1		1	1							
Prince Edward Island	C	2												1	1			
Quebec	C	28	14	34	12	5	3	2		2				1	1	1		
Montreal	C	16	4	4	1			1										

Quebec	C		3	1	1	2								1				
Riviere du Loup	C			1														
Saskatchewan	C	70	13	13	14											1		
Moose Jaw	C		1															
Saskatoon	C		1															
China:																		
Amoy	C	5	3	4	2													
Canton	C	86	135	85	46	5	2	6	3	5	3	3	1	2				
	D	15	5	12	4	1				1	1							
Chefoo	C			P	P													
Foochow	C	P	P	P														
Hong Kong	C	189	92	53	29	2	2	4	2		1			1		3	1	
	D	246	137	97	25	2	2	1	1	3	2				1	2	1	
Manchuria—																		
Changshun	C	2		1														
Harbin	C		1	4														
Kwantung—																		
Dairen	C	9	1	11	21	2	2	4	3	4	6	4						
	D	3		4	8	2		1		4	2	3						
Port Arthur	C				3													
Mukden	C		1															
Nanking	C											P	P	P	P			
Shanghai—																		
Foreigners only	C	11	4	1	6		2		5	1	1	1						
Including natives	D	41	25	16	16	1		2	2			1						
Swatow	D	9	33	93	62	9	9		6	2	6	5	2	2				
Tientsin	C	2	8	6	12													
Tsingtao	C	P	P	P	P		P	P	P									
Yunnanfu	C		P	P														
Chosen (see table below).																		
Colombia:																		
Barranquilla	D											2						
Cartagena	D	7																
Curacao (alastrim)	C			1														
Dutch East Indies:																		
Balikpapan	C	1	5	3	4		1											
Belawan Deli	C	9	7	4					1		1		1					
	D	6	2										1					
Borneo	C	26																
Samarinda	C	47	2	1					3	9	2	2		7				
	D		3						1									
Celebes—Makassar	C		6	39	43	5	4	5	6	6	4	5	6	2	1			
	D		2	25	33	4	2	4	5	3	3	3	2	1	1			
Java—Batavia and West Java	C				1		1	5			6				2			
	D					1									2			
Sumatra—																		
Baros	C	36	16															
	D	5	2															
Medan	C	9	7	2	1				1		1	1						
	D	6	3		1							1						
Palembang	C	9																
	D	2																

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Feb. 10–Mar. 9, 1929	Mar. 10–Apr. 6, 1929	Apr. 7–May 4, 1929	May 5–June 1, 1929	Week ended— June, 1929				July, 1929				August, 1929				
						8	15	22	29	6	13	20	27	3	10	17	24	31
Ecuador (see table below).																		
Egypt:																		
Gharbieh	C	1																
Port Said	C			1				1										
Suez	C			5														3
France (see table below).																		
Great Britain:																		
England and Wales	C	1,083	1,156	1,423	1,179	272	191	166	160	153	115	144	129	129	114	120	139	
Ashton under Lyne	C												7		2	1		
Birmingham	C			1	1													
Bradford	C	2	3	1	4	2	2					2	1					
Bristol	C										1							
Cardiff	C		1	1	4													
Castleford	C	85	56	31	12	2			1		1							
Leeds	C	6	8	3			1						1				1	
Liverpool	C		1															
London	C	54	58	201	193	69	41	40	17	43	16	30	18	31	19		28	
London and Great Towns	C	425	598	888	656	166	120	113	97	103	64	109	87	73	60	74	90	
	D		3	6	3			1		1	2		1					
Newcastle-on-Tyne	C	6	10	3	37		11		9	9	4		2	1	2		1	
Nottingham	C		2															
Stoke-on-Trent	C	18	72	133	86	24	9	13	16	5	7	11	9	1	10	1	6	
West Ham	C												26	22	17	20		
Scotland—																		
Aberdeen	C			2														
Glasgow	C		1	19	1													
Greece (see table below).																		
Hedjaz	C	108	84	77	40	23	19	22	19	27	8	7	11	4	2			
	D	40	52	52	24	11	12	16	14	21	2	4	8	3	2			
Honduras: Puerto Castilla	C				1													
India	C	14,890	19,120	22,556	17,011	3,295	2,942	2,674	2,668	2,249	1,966							
	D	3,285	3,983	5,060	4,185	891	693	690	723	533	534							
Bombay	C	397	441	315	208	38	42	36	31	28	21	22	21	18	18	16	11	
	D	188	206	175	131	22	27	27	23	13	15	12	15	7	9	12	3	

Calcutta	C	104	127	101	39	7	4	8	8	6	3	2	5	13	2	9	7	
	D	29	77	74	36	7	4	7	6	4	3	1	3	11	2	3	6	
Karachi	C	147	206	144	84	8	13	10	4	6	3	12	4	6	1	2	6	
	D	14	70	59	59	6	8	7	4	6	1	6		1	1	1	4	
Madras	C	260	392	327	174	21	17	28	22	25	39	24	34	28	16	33	12	
	D	61	83	84	61	2	6	8	4	6	12	10	4	8	6	2	6	
Moulmein	C	14	18	7	8	3			3	1	4		5	2	8	1		
	D	4	4	6	6	2			3	1	3		1	1	3	1		
Negapatam	C	5	9	7	2		2	1	3	1	1	2						
	D	4	1															
Rangoon	C	17	13	7	1					1	2			1				
	D	6	6	3	1					1								
Tuticorin	C	1		1			1											
Vizagapatam	C	52	26	28	2			2	2	2			1					
	D	9	5	8				1	1				2					
India (French):																		
Karikal	C		2	2	3		1	3	1			1		2	10			
	D		2	2	3		1	3	1			1		2				
Pondicherry Province	C	79	70	60	32	4		7	7	5	4	8	4	6	3	2	1	
	D	61	60	51	30	3		7	5	5	4	3	4	1	3	2	1	
India (Portuguese)	C				3	8	1				1	1	2					
Indo-China (see also table below):																		
Pnompenh	C	62	68	40	22	1	3	2	2	5	1	3			2	1		1
	D	36	33	24	12	1	1			1	1	1		1	1	1		1
Saigon and Cholon	C	2	2	2	1								1					
	D				1				1									
Iraq:																		
Baghdad	C	7	6	6	3		1					1						
	D	5	1															
Basra	C	7	9	8	8	8		1				1						
	D	5	2	6	8	1												
Diyalah Liwa	C				48					8							13	
	D				13					2							12	
Kirkuk Liwa	C	18																
	D	4																
Mossoul	C	28					12	6	2	12				21			60	
	D	4												1			12	
Italy: Turin	C	1																
Ivory Coast (see table below).																		
Jamaica (outside Kingston) (alastrim)	C			1	1						7							
Japan:																		
Kobe	C	1																
Niigata	C				12		2											
Osaka	C	1			1													
Shimane Province	C		16	3														
Tokyo	C				2		1											
Macao	D	75	32	20	5			2										
Mexico:																		
Acapulco	C			1	1	1		1			3			1	2			
	D			1	1	1		1			3			1	2			
Aguascalientes	D	3	5	9	6	5	4	3	5	3	5	2	1	2	3	1	1	
Chiapas Province	C		P															
Coahuila	D							1										

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Feb. 10–Mar. 9, 1929	Mar. 10–Apr. 6, 1929	Apr. 7–May 4, 1929	May 5–June 1, 1929	Week ended— June, 1929				July, 1929				August, 1929				
						8	15	22	29	6	13	20	27	3	10	17	24	31
Mexico—Continued.																		
Jalisco (State): Guadalajara	D	8	13	12	15	3	3	1	4	5	.....	1	.....	1	2	.....	2	5
Juarez	D	1	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	P
Mexico City and surrounding territory	C	2	1	.....	1	3	1	2	3	3	2	3	5	5	5	7	.....	.....
Oaxaca—Zacatepec	C	.....	.....	P	.....	.....	1	1	6	1	.....	.....	2	.....	3	3	.....	.....
Palomas	C	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tampico	C	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Vera Cruz	D	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Morocco (see table below).																		
Netherlands: Rotterdam	C	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40	30	53	58	.....	.....
Nicaragua: Managua	C	.....	.....	P	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nigeria: Lagos	C	.....	1	1	2	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....
Norway: Stavanger	C	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Palestine	C	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Panama [1]	C	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	7	.....	.....	1	.....	4	4
Panama Canal Zone	C	.....	P	.....	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Persia (see table below).																		
Poland	C	.....	.....	6	2	.....	35	31	.....	.....	.....	.....	.....	.....	.....	1	.....	.....
	D	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Portugal:																		
Lisbon	C	.....	3	4	1	1	2	2	1	3	.....	.....	1	.....	1	.....	.....	.....
Oporto	C	.....	1	2	.....	.....	.....	1	1	.....	2	.....	.....	.....	.....	.....	.....	.....
Senegal (see table below).																		
Siam	C	4	.....	55	32	21	1	5	.....	23	43	3	2	1	.....	.....	.....	.....
	D	.....	.....	8	9	5	1	1	.....	2	11	1	.....	.....	.....	.....	.....	.....
Somaliland, British: Boales	C	.....	.....	.....	.....	.....	5	.....	6	.....	1	3	.....	.....	.....	.....	.....	.....
	D	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....
Somaliland, French: Jibuti	C	.....	.....	.....	3	2	5	3	6	8	7	25	83	8	10	.....	7	.....
	D	.....	.....	.....	1	2	2	.....	4	2	1	2	16	11	1	.....	3	.....
Spain: Valencia	C	2	5	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Straits Settlements: Singapore	C	3	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sudan (Anglo-Egyptian)	C	188	245	377	1,570	228	243	113	588	323	25	724	49	55	11	12	9	.....
	D	54	29	26	132	40	60	47	48	28	9	115	12	51	1	5	16	.....
Sudan (French) (see table below).																		
Syria (see table below).																		

Tunisia: Tunis	C	5		2			1		1	1								
Turkey (see table below).																		
Union of Socialist Soviet Republics: Vladivostok	C				2													
Union of South Africa:																		
Cape Province	C			P	P	P	P											
Transvaal	C		P	P	P	P												
Upper Volta	C	4	4	15	2	2		5	3									
On vessel:																		
S. S. Aorangi, at Sydney	C								1									
S. S. Assyria, at Suez, from Bombay	C				1													
S. S. City of Hereford, at Brisbane, from Calcutta	C											1						
S. S. City of Venice, at Suez, from Calcutta	C				1													
S. S. Fern, at Port Said, from Abadan	C				P													
S. S. British Birch, at Suez, from Abadan	C								1									
S. S. Keneh, at Suakim, from Jeddah	C							4										
S. S. La Panto, at Suez, Egypt	C				4													
S. S. Lopez-Lopez, at Suez	C			1														
S. S. Malwa, at Suez	C			1														
S. S. Mancar, at Suez, from Calcutta	C			1														
Tantalus (motor ship), at Amsterdam	C		3															
S. S. Tuscania, at Glasgow, from Bombay	C			P														

Place		January, 1929	February, 1929	March, 1929	April, 1929	May, 1929			June, 1929			July, 1929			August, 1929	
						1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20
Indo-China (see also table above)	C	311	364	561	755	343	67					87	72			123
Ivory Coast	C			4												
Senegal	C		80	70	57		1									
	D		8	11	15											
Sudan (French)	C			26	83	2					87	2	13			
	D			3							15					
Syria: Beirut	C	1	48	12	18	4		8	18	12	6	26	1		16	

Place		February, 1929	March, 1929	April, 1929	May, 1929	June, 1929	July, 1929
British East Africa (see also table above):							
Kenya	C		23	91	38	45	
Chosen: Chinampo	C	1					
Ecuador: Guayaquil	C	4	2	2	1		
	D	1					
France	C	3	5			15	
Greece	C	5	2	4	5	2	
	D	1					
Morocco	C	11	8	12	39	2	9
Persia	D	23	8				
Turkey	C	7		1		11	

[1] 106 cases of smallpox were reported from June 16 to Sept. 14, 1929, in Panama City, Panama.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

Place		Feb. 10–Mar. 9, 1929	Mar. 10–Apr. 6, 1929	Apr. 7–May 4, 1929	May 5–June 1, 1929	Week ended— June, 1929				July, 1929				August, 1929				
						8	15	22	29	6	13	20	27	3	10	17	24	31
Algeria:																		
Algiers	C		6	11	1	1					1	6	2		3	1		
Constantine Department	C	13	3			1	3	7							2			
Oran	C	2		8	14	1		4		3		6			2			
British South Africa: Northern Rhodesia	C				3													
	D				3													
Bulgaria	C	39	40	28	21	1	2	1		1	2	2	7					7
	D	2	5	2	1			1			1	1						
Sofia	C											1						
Chile:																		
Concepcion	C		2		1													
Valparaiso	C									1								
China: Manchuria	C		1															
Chosen (see table below).																		
Czechoslovakia (see table below).																		
Egypt:																		
Alexandria	C		1	1														
	D		1		1													
Assouan Province	C	2																
	D	2																
Beheira Province	C	13	67	50	159	13				5			3	25				
	D		9	9	24	6				2			2					
Cairo	C				2					1		1						
Daqahliya Province	C		34															
Gharbieh	C	2																
	D	1																
Menoufieh Province	C			35														
Port Said	C				2	1			1	3	1			1				
Greece (see table below).																		
Hungary	C				1													
Indo-China (see table below).																		
Ireland (Irish Free State):																		
Cavan County—Carrickmacross	C				1													
Cork County	C	1																
Donegal County—																		
Inishower	C			1														
Stranorlar	C						1											

Kerry County—																			
Dingle	C		2	2															
Killarney	C	1		2															
Tyrone County, Strabane,[1]																			
Latvia (see table below).																			
Lithuania (see table below).																			
Mexico:																			
Aguascalientes	D		5							1							1		
Mexico City, including municipalities in Federal District	C	7	4	4	8	6	2	4	2	4	2		5		7	2			
	D	2		1	2		1												
Morocco	C	17	19	28	5		2	5	5		27			3		3			
	D			4							11								
Norway: Oslo	C			12	2														
Palestine	C		2		2			2		1	1	1	1				1	1	
Persia	C								5	18									
	D								4	6									
Poland	C	202	295	314	264	78	35	31	33	25	24	25	16	16	12	12			
	D	18	20	25	15	2		2	3	1	1	2		3	1	3			
Portugal:																			
Lisbon	C							1											
Oporto	C								1										
Rumania	C	211	220	135	179		36	32	23	7	19	2							
	D	28	30	16	31		3	5	5	1	1								
Tunisia	C	3	20	19	22	12	8	3		1	2				4				
Turkey (see table below).																			
Union of South Africa:																			
Cape Province	C	P	P	P	P	P	P			P	P	P	P						
Natal	C	2	P	P	P		P												
Orange Free State	C	P		P	P	P	P			P			P						
Transvaal	C		P	P	P	P	P						P						
Yugoslavia (see table below).																			

Place		February, 1929	March, 1929	April, 1929	May, 1929	June, 1929	July, 1929
Canada: Ontario	C					1	
Chosen: Seoul	C		3	2	1	2	
Czechoslovakia	C	7	41	25	18		
	D	1	1		1		
Greece: Athens	C	4	4	2		3	
Indo-China: Tonkin	C			2			
Latvia	C		1	10	7	5	
Lithuania	C	24	62	101	63	27	10
	D	3	1	7	5	4	1

Place		February, 1929	March, 1929	April, 1929	May, 1929	June, 1929	July, 1929
Mexico (see also table above):							
Sonora	D						
Turkey	C	3	11	3	7	10	
	D	1			1	3	
Yugoslavia	C	13	7		19		3
	D	2			1		1

[1] During the period from Apr. 14 to May 21, 1929, 18 cases of typhus fever with 4 deaths were reported in Strabane, Tyrone County, Ireland.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		Feb. 10–Mar. 9, 1929	Mar. 10–Apr. 6, 1929	Apr. 7–May 4, 1929	May 5–June 1, 1929	Week ended— June, 1929 8	15	22	29	July, 1929 6	13	20	27	August, 1929 3	10	17	24	31	Sept. 7, 1929
Belgian Congo: Tumba	C			1															
Brazil:																			
Bahia	C		1							1									
	D		1							1									
Guaratingueta	C	[1] 1																	
	D	[1] 1																	
Nictheroy	C										[1]								1
Para	D		5																
Pernambuco	C		4																
Porto Alegre	D				[1] 1														
Rio de Janeiro	C	92	252	180	70	5	2	0	0	0	1	0	0	0	0	0			
	D	67	132	94	38	3		2			1								
Colombia:																			
Simacota	C												4						
Socorro [2]	C									6			6						
Liberia: Monrovia	C	7	10	2				1	3	4									
	D	4	4						3	1									
On vessel:																			
S. S. Skogland, at Porto Alegre, from Rio de Janeiro	C				1														

[1] Imported.

[2] From June 19 to July 8, 1929, 41 cases of yellow fever with 23 deaths were reported in Socorro, Colombia.